August 1982

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sinclair user

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Issue No 5



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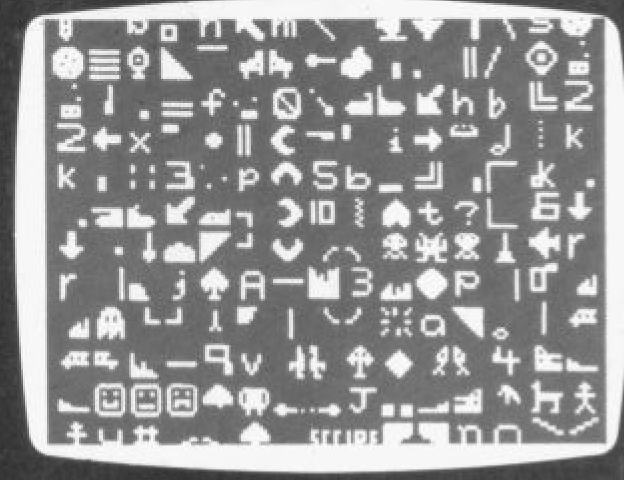


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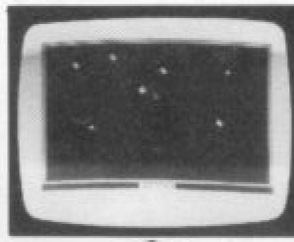
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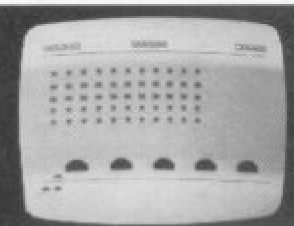


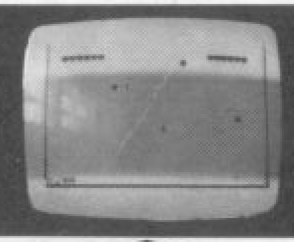
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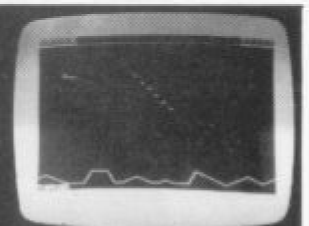
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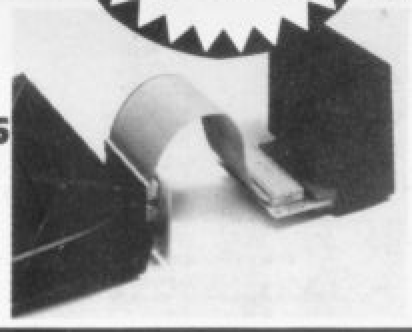


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NEXT MONTH

- **Special Education Edition — We look at the uses for Sinclair machines and the growing amount of software available.**



Portable systems can boost outdoor thrills

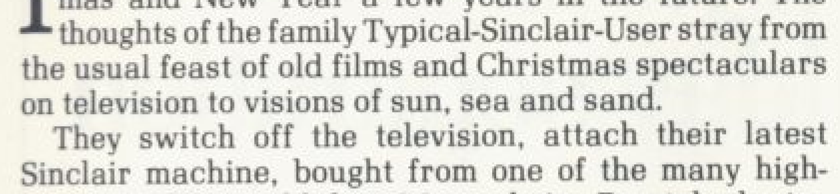
IT IS a bleak winter's day in the hiatus between Christmas and New Year a few years in the future. The thoughts of the family Typical-Sinclair-User stray from the usual feast of old films and Christmas spectaculars on television to visions of sun, sea and sand.

They switch off the television, attach their latest Sinclair machine, bought from one of the many high-street stockists, add their Martochoice Prestel adapter and turn to the Prestel holiday pages.

Following the eventual development of the adapter for the Sinclair machines, Prestel enjoyed a boost in the number of domestic users. A full range of holiday operators have since found it worthwhile to give details of their holidays all over the world.

The Typical-Sinclair-Users select a group of holidays in which they are interested and request more details. Those arrive on the screen immediately and are printed-out. Pictures of the resorts and the facilities arrive through the post a few days later.

From those, the TSUs decide. Unfortunately when they try to book, again through Prestel, they find their first choice of time, destination and operator is fully-booked. They bring their second choice to the screen and find there are vacancies. They make their booking, paying the deposit by debiting their bank account



directly by Prestel. Once that is done, a bill for the balance and a listing of the holiday details arrives on the printer.

As the time for the holiday approaches the TSU family, between playing the latest game of aliens and keeping their household accounts in order, check the weather conditions at their chosen resort and the strength of the peseta against the pound — all available through Prestel.

As the TSUs hate shopping, having to push their way through the crowds, they decide to buy all their holiday clothes and equipment by mail order, again using Prestel.

Their tickets finally arrive, printed on the ingenious micro colour printer developed by Sinclair Research. That add-on had been produced in response to a number of attempts by other companies to make something which allowed a record to be kept of the Spectrum displays and the claim by a number of people that not even Clive could produce a colour printer at a reasonable price.

Pausing only to cancel the milk and *Sinclair User* — by Prestel, of course — switch off the Sinclair-controlled air-conditioning system and transfer control of the home security to the neighbours' Sinclair so that they can look after the house, the Typical-Sinclair-Users begin their great adventure.

The luggage consists of the usual suitcases but also includes a large black briefcase. When they arrive at the airport, they find many other families have the same black briefcases. All are treated with great care, are taken inside the aircraft as hand luggage and stored carefully under the seats.

They arrive in Majorca, everyone still taking great care of their black cases. On reaching their hotel everyone immediately rushes to their rooms, where the secret of the black box is revealed. Inside there is a complete Sinclair computer system, neatly packed in plastic foam. The VDU is one of the Sinclair flat-screen televisions and it is powered by a light but powerful battery developed as part of the Sinclair electric car project.

The following day the TSU family goes to the beach and, in common with many others, they take their briefcase and spend half the day enjoying the sun, sea and sand and the other half playing with the Sinclair.

The case also contains a device which allows the Typical-Sinclair-Users to contact their neighbours via the telephone service or collect any recorded messages on their telephone answering service.

If this sounds a little far-fetched, as though the Sinclairvoyance crystal ball is even less clear than usual, consider that most of the items are already in existence and are available either for the Sinclair machines or can be adapted from hardware available with other computers. The two items which do not exist are the colour printer and the lightweight battery but that is no guarantee that they will not appear on the market.

The rest of this look into the not-too-distant future depends on how people react to the possibilities provided by a light, fully-portable computer system. It may be a little unreal to suggest that people will take every opportunity to avoid leaving their homes. It would be pleasant to think that the gregarious nature of people would rebel against being cut off from their fellow human beings.

The enthusiasm with which many take any opportunity to cut themselves off and carry around their own little world, however, would appear to argue against this. It is one of the reasons why cars are preferred to public transport and why growing numbers of people can be seen walking around with headphones listening to small cassette players.



Do Sinclair machines get lonely being left at home during summer holidays? Nicole Segre considers the problem.

Taking the pain out of holiday separation

ENJOYABLE though it may be for some, holiday time has always brought its special problems. I do not mean only dilemmas such as what one wears — if anything — in St Tropez, or for hang-gliding over the Niagara Falls, or for whatever other delights one has in store. I speak of real anxieties such as who will water the plants.Even if the cat could be persuaded to do it, who will feed the cat? How will the burglars be lured into thinking that three burly men are in residence when the whole street looks more dead than John Cleese's Norwegian blue parrot?

Now, to add to all that, there is a new problem — what happens to my son's ZX-81? I realise how silly it sounds but I have to confess that I have wondered whether it would be all right on its own. Would it rust? Or do chips go stale for lack of use? Would dust get into its nooks and crannies and make it behave strangely, like something taken-over by beings from outer space? Would Alex on his return from holiday be wandering about saying: "I know you think I'm crazy but that is not my computer. It looks like my computer but something has happened to it. It is not my computer".

Have I been watching too many late-night films? Do computers have feelings? Should I ask someone to come each day not only to feed the cat and water the plants but to dust the computer and talk to all of them,too? Last but not least, how would my son cope with the strain of a whole summer unrelieved by a single game of Monster Centipedes or Asteroids' Revenge — I do hope I have those names correct. Will that American university, which gave us Rubik's thumb and Clacker wrist, discover another ailment associated with popular pastimes? ZX addiction perhaps, or more likely Sinclair Eye. I can imagine thousands of people wandering around wearing dark glasses on even the dullest day as they walk for the first time in the open air for some months, their hands twitching as they suffer withdrawal symptoms from using the keyboard.

I need not have worried, though, and I feel much better about it after a brief talk I had with Keith Hall. I should explain that he is responsible for all the computer madness, or Sinclair Syndrome, in our household. He introduced my son to the ZX-81 by starting a computer club at his school. I hasten to add that in every other respect he is a splendid chap.

He told me that one reason the Sinclair is so eminently suitable for school use is that its keyboard, which many of us agree is maddening to use, is also very resistant, able to withstand spilt drinks and countless sticky fingers, never mind a little bit of dust. In fact, one ZX-81 has even been run from a car battery in a muddy back garden, without ill-effect.

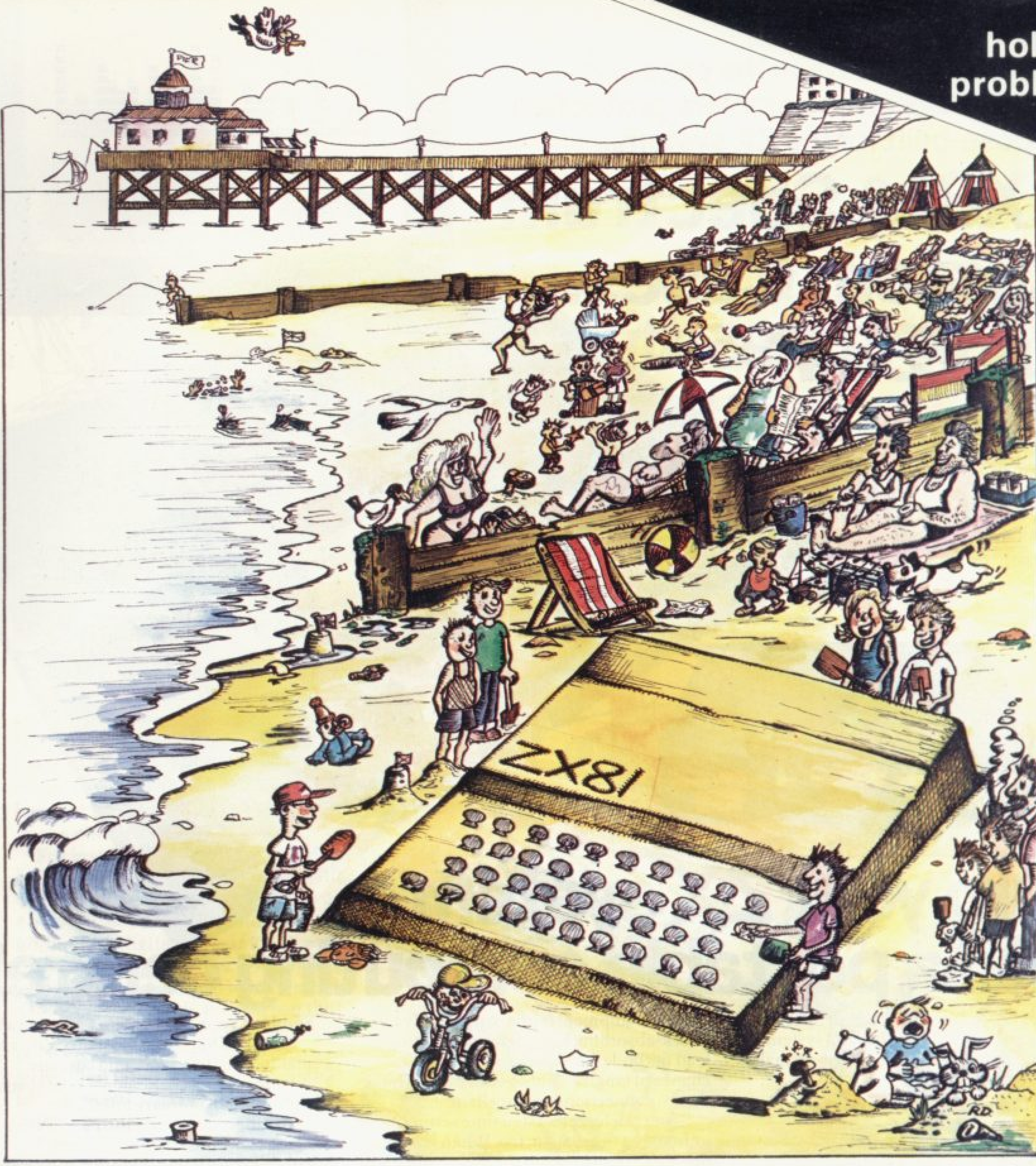
'No longer need Sinclair users endure long weeks of computer deprivation; they can take their computers with them.'

Further, it appears that my oft-repeated complaints about the Sinclair never doing anything useful are completely unfounded. According to Hall, with the necessary modifications and appendages — I will not go into all the technical details as I do not want to confuse you — the Sinclair can be made to do almost anything. Even feeding the cat and watering the plants, I dare say, although I would not trust it to know which was which and certainly not to speak to them pleasantly.

This opens-up an interesting possibility. No longer need Sinclair users endure long weeks of computer deprivation; they can take their little computers with them. While those of us with more old-fashioned tastes splash about in the waves or walk through breathtaking scenery, they could be sitting within wire's reach of a car engine, eagle eyes trained on a screenful of moving blobs, astounding the locals by their skill and by the amazing advances of British technology.

It could be the start of a completely new way of spending holidays. Beach computer clubs could spring up in the resorts of Europe — or more likely car park computer clubs. Parents could be seen rushing into the sea to rescue machines caught by an unexpected wave. Sand-castle competitions would be a thing of the past, replaced by attempts to make the highest score on the car race game.

Perhaps they could even find ingenious new tasks for their computers to perform — testing the temperature of the water, perhaps, or acting as mosquito early-warning systems. It would be a simple matter



to store a few useful foreign words and phrases such as "Where is the nearest football stadium?" or "I would like to speak to the head waiter".

On second thoughts, it all seems a little impracticable. If you took your computer on shopping trips to display requests like "Please give me the yellow one", you would not be able to carry your shopping.

A trip to the beach would go like this: "Do you have your swimsuits? Towels? Beach mat? Parasol? Ball? Frisby? Sunglasses? Camera? Binoculars? Radio? Computer? Television set?" Somehow, I do not see it. Besides which, even if there is room to pack a computer on the outward journey, there would not be on the return, following that well-known phenomenon by which suitcases always become smaller on holiday, or the contents grow bigger — it has not been proved conclusively either way.

Alternatively, I send Alex to one of those computer camps, the Butlins of the micro world, where he can enjoy outdoor activities as well as crouching over his computer. I suppose that is intended to make him physically fit enough to be able to spend the rest of the year wth his Sinclair without too many ill-effects.

The more I think about it, though, the more I think this is getting out of hand. Our lives are not to be ruled by a small plastic box, no matter how full it is of electronic marvels. The last few months have been bad enough, without it deciding how we should enjoy the brief days of good summer weather.

I am going to put my foot down firmly and oppose any moves to take a Sinclair away with us this year. A break with the trappings of civilisation will do us all a world of good. Enough of flickering screens, moving targets and exploding galaxies — we shall restore ourselves with fresh air, sunshine and bird-song.

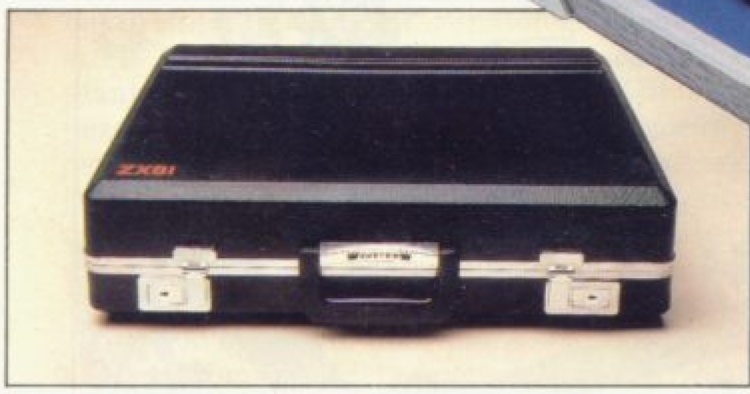
Now if you will excuse me, I must go and pack. If I hurry, I might even have time for a quick game of Colliding Space Intruders, as it will be a long time before I have the chance again.

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Relax with a pretty number pattern

Ian Stewart looks at a rewarding way in which to spend a few hours playing with number series and loops

MATHEMATICIANS call it iteration — repeating a process over and over again to see what you get. Which means, fancy names notwithstanding, that it should be easy meat for a computer. Because, after all, doing the same thing over and over again is what computers do best.

I do not mean exactly the same thing, of course — not like the student who was asked. "What do you get if you add 3 to 40 three times?" and who replied "I get 43 every time". I mean the same process but using the result of one stage as the starting-point for the next.

For instance, suppose the process is "add the digits". If we start with 479, then adding the digits gives 4+7+9 = 20. Now iterate, by adding the digits of that: 2 + 0 = 2. Iterate again, well; it is 2 + nothing else, that is 2 again. So we are stuck at 2. It is reasonably easy to see that whatever number with which you start you will eventually get down to a one-digit number, and stop. So that is not worth taxing the poor old ZX-81 brain.

What if we add the squares of the digits? Then 479 would lead to 4*4 + 7*7 + 9*9, or 16 + 49 + 81, which is 136 — well, 146, I made a mistake; and that — well, perhaps the ZX-81 is good for something after all. Let us write a small program to do the iteration for us:

```
10 INPUT N
20 PRINT AT 19,0;N
30 LET A = 0
40 LET M = INT(N/10)
50 LET A = A + (N-10*M)*
   (N-10*M)
60 LET N = M
70 IF M = 0 THEN GOTO 90
80 GOTO 40
90 PRINT AT 20,0;A
100 SCROLL
110 LET N = A
120 GOTO 30
```

See what it does? You give it the starting number N. It uses A to add the squares of the digits — those (N-10*M)s are the digits — and prints it out; SCROLLs to make room for the next step; then sets N equal to the result A and goes back to line 30 to start all over again, iterating like mad.



Type it in; try a few values for N. It will go on forever unless you hit BREAK, but keep watching — perhaps you will notice a pattern.

What happens eventually is that the numbers settle down to some kind of regular behaviour but it can be a surprising one. For instance, try N = 89. You will get, successively, 145, 42, 20, 4, 16, 37, 58, 89. The iterations brought us back to

continued on page 10







continued from page 9

where we started and the silly beast is going round in an endless loop. You will find that many starting values for N lead into the same loop. That is interesting, really; you would not have guessed it initially. Some numbers do not get into that loop, though; try N = 7 as a starting point. You can have plenty of fun trying different starting values and comparing the way the numbers evolve.

If squares are not for you, perhaps you would prefer cubes? Thanks to Professor Rubik they are fashionable but our cubes are things like 2*2*2 = 8, or 3*3*3 = 27. Just modify line 50 of the program to read

```
50 LET A = A + (N-10*M)*
   (N-10*M)*(N-10*M)
```

and proceed as before. This time there is a new surprise — the number 153 goes to itself. There are some other numbers which equal the sum of the cubes of their digits; can you find them? On the other hand there are some loops, too; for instance

133 → 55 → 250 → 133 → . . .

Insert yet another (N-10*M)* in line 50 and you have fourth powers. Here is a nice loop, too:

4514 → 1138 → 4179 → 9219 → 13139 → 6725 → 4338 → 4514 → . . .

Fifth powers? You should be able to work out the modification to the program by now. There is a loop of length four:

10933 → 59536 → 73318 → 50062 → 10933 → . . .

Experiment with different powers and different starting-points N. It is a relaxing way to spend a few hours and there are plenty of patterns to spot. The one general thing which is known is that from whatever number you start, you must eventually end in a loop, or with a number which goes to itself, forming a loop with only one number in it.

Essentially that is because if you start with a big enough number the sum of the powers of its digits has to be smaller; so the numbers keep shrinking until they are trapped in a limited range. Once there, they hop around and since they cannot keep going to different values forever, there being only a limited range available, something has to repeat.

There is one amazingly simple iteration process about which nothing of the kind has ever been proved, even though most people think it must be true. It is called the *Kakutani Problem*. The iteration process is:

If N is even, halve it.

If N is odd, treble it and add 1.

Problem: does everything end in the loop 1 → 4 → 2 → 1 → . . . ?

Here is the program:

```
10 INPUT N
20 LET C = 0
30 PRINT AT 20,0; N
40 SCROLL
50 IF N = 2*INT(N/2) THEN
   LET NO + N/2
60 IF N <> 2*INT(N/2)
   THEN LET NO = 3*N + 1
70 LET N = NO
80 LET C = C + 1
90 IF N = 1 THEN GOTO 110
100 GOTO 30
110 PRINT AT 21,0; "HIT LOOP
   IN□";C;"□STEPS"
(□ = SPACE)
```

If you experiment with this, you will find that the behaviour is most irregular. For example, N = 29 hits the loop after 18 stages and so does N = 30; but N = 31 requires 106 steps to reach the loop and the numbers become as big as 1780 on the way. Then 32 stops in only five steps and 33 in 26 steps. The numbers hop around all over the place; they get smaller, smaller — suddenly bigger instead. Could they keep growing forever and miss the loop completely? Nobody knows.

Of course, you cannot decide that on a computer; there is no way to carry-out the computation forever, to see if it keeps growing. You can, however, have a general feeling about the way the numbers behave by trying them. A biggish start, like 1111111, hits the loop after 165 steps. Generally, runs where the numbers shrink tend to occur more often than ones where they grow.

Despite that evidence and an enormous number of computer experiments, the problem remains completely unsolved, which is remarkable, considering its simplicity. It shows that there is plenty of life left in mathematics and that not every problem can be solved just by putting it on the computer. It is also an intriguing example of elusive number patterns and the computer is a valuable aid in finding them.



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Computer camps were introduced to Britain last year and proved so popular that they have been expanded rapidly.

Picturesque setting for micro courses

Hundreds of teenagers will this year be able to learn all about the Spectrum and the ZX-81 against the picturesque backdrop of the Lake District. Beaumont Summer Camps has decided to instal a number of the machines at its new residential camp six miles south of Carlisle.

Children between the ages of 10 and 17 are able to enjoy holidays at the camp in which half the day is spent working on the Sinclair machines and the other half can be used to take part in the many other activities available.

According to the organisers, it is assumed that most of the children will have no previous experience of computers of any kind. They say they have "designed a special programme to ensure that the campers' first encounter with a computer is most enjoyable and rewarding experience." They also promise to "de-mystify the computer".

Three levels of instruction are provided to take account of all levels of knowledge. The subjects covered will include how computers work, computer jargon, programming in Basic, possible future applications, and progress to floppy discs, graphics, word processing and other languages.

It is expected that most of the campers will have a working knowledge of Basic programming after two weeks.

The computer course is linked to the other activities available at the camp, which mainly involve moving outdoors and enjoying the magnificent countryside. The camp provides tuition in camping, fell walking, sailing, pony trekking, canoeing and many other activities.

It was the idea of Stewart Wiley, a former holiday tour operator who decided to set up holiday camps for children after he had seen the success of similar camps in the United States.

"When I was on holiday in the States, I saw a television programme about a computer camp which had been started in Santa Barbara, California. I contacted the person who had set it up and he



visited England to advise on the setting-up of a similar camp in Britain," Wiley said.

Last year he opened his first camp at St John's School, Windsor — a day camp with buses taking children from the area to the camp every weekday.

As at the residential camp, the activities included outdoor sports and the opportunity to learn about microcomputers. At Windsor the programme was based on the Commodore Pet. It was not until this year and the decision to set up a residential camp that he became involved with Sinclair machines. They are now the only machines available at the Carlisle camp. At the day centre the courses use Vics and Tandys.

Robin Heath, director of the computer camps, said that one of the reasons for choosing Sinclair machines was that the average age of children at the residential camp would be higher than that at the day centres.

"Younger children can have difficulty with the keyboards on both the ZX-81 and the Spectrum but the average age at the Lake District camp should be about 13 and many children of that age already have ZX-81s and find no problem with them," Heath said.

He added that since the decision they had found the machines to be very resilient and that would be an advantage in being able to withstand the extra use.

"I made the decision to choose Sinclair exclusively because I thought it would be worthwhile for the future to have a close association with the company," said Wiley.

The first venture at Windsor was so successful that Wiley decided on a massive expansion for this year. As well as the Windsor camp and the new Lake District residential camp, there are other day camps being organised at Mill Hill on the outskirts of London, at Sevenoaks, Kent, and Knutsford, Cheshire.

"Last year was very successful," said Wiley. "We had spaces for 300 and could have filled them many times over".



Phil Garrett looks at ways of enjoying your holiday despite poor weather

Greye defender is another 3D winner

IF YOU ARE the type who goes to the seaside to spend hours — and pounds — in amusement arcades, there is a new crop of ZX-81 action games to tempt you to stay at home.

J K Greye, famous for its remarkable **3D Monster Maze,** has scored again with **3D Defender.** This all-machine-code game for 16K ZX-81s has the player steering the last surviving craft of a once noble battle fleet into action against marauding invaders. Using the keyboard like a joystick, you can climb, dive and bank, watch the stars wheel about and the ground slip past, but keep an eye open for the bad guys and their plasma bolts. The game requires quick reactions and good co-ordination — a minimum of five fingers are in action — and takes a good deal of practice before any score is achieved. Amazing graphics effects are created as the enemy draws closer, more and more detail appearing as the flying saucers loom in your forward scanner. Another winner for £3.95.

If you have spent the money you had saved for your RAM pack on your holidays instead, J K Greye offers arcade-game action in just 1K. Its full-screen **Breakout**, written in an incredible 500 bytes of machine code, has all the capabilities of the bigger versions. The bricks are inverse £ signs, which turn into $ signs when hit, and then disappear altogether when hit again. The game has adjustable bat size and speed, plus on-screen scoring and variable rebound angle. All for £1.95 from J K Greye Software, 16 Park Street, Bath, Avon, BA1 2TE.

Taste of exotic from Diggles

ONCE YOU have returned from your two weeks in the European sun, how can you recapture that taste of the exotic? Photographs and souvenirs are all very well but what about food? Your 16K ZX-81 can revive those memorable meals with the aid of **The Diggles Kitchen**. Volume one contains 28 recipes from all over the world — Cyprus chicken, Spanish hake, Italian roast lamb, plus recipes for beef, hare, turkey, duck, ham and many more. If you have had enough of foreign food, you will find Lancashire hotpot and steak and kidney pie included. If you did not go overseas this year, why not turn up the central heating, serve Hawaiian pork, and dream a little?

The Diggles Kitchens, volume one and volume two — European recipes — cost £4.99 each or £9 the two from Micro Computer Software, Unit D6, Pear Industrial Estate, Stockport Road, Lower Bradbury, Stockport SK6 2BP.

Carnell adventure

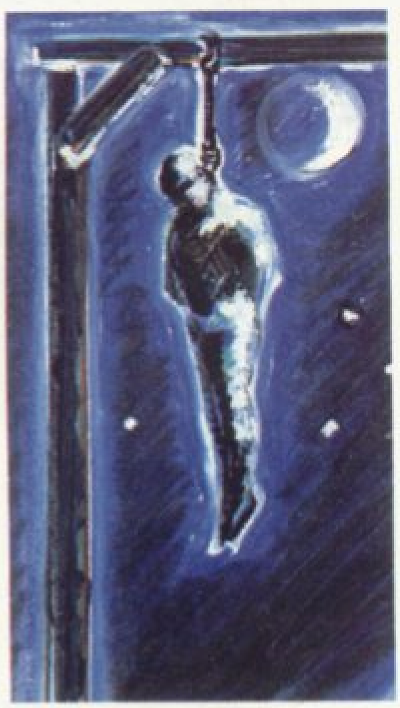
IF YOU are bored with soaking-up the sun, or cannot become enthusiastic about a day trip to Clacton, how about widening your horizons with an **Adventure**? Carnell Software has produced three 16K cassettes, each with an adventure and another substantial game.

In **Volcanic Dungeon**, you enter the realm of myth and magic to rescue the Princess Edora from the three-fold clutches of the goddess of evil, the Snow Queen, and the Witch of the Black Mountains. You are given a map of the 80 connected caverns, filled with monsters, pits and fire. Armies of goblins and ice giants await. Weapons and magical objects are scattered around and you must watch your strength and water levels.

Also on the cassette is **Hangman** with a built-in 400-word vocabulary; the program allows for easy or difficult words, one or two players, and has full screen graphics.

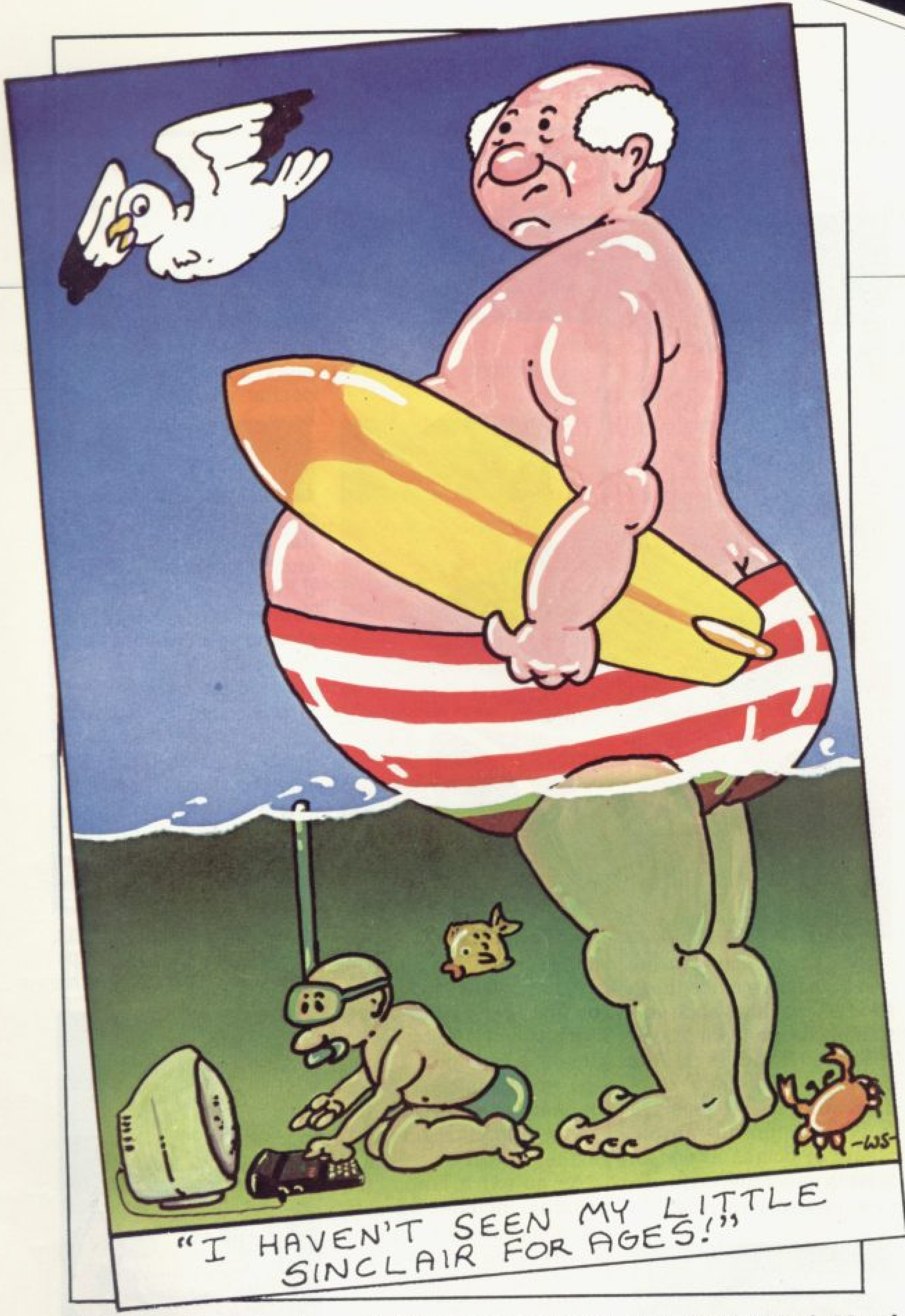
In **Alien Intruder** you wake from cryogenic suspension to find that the rest of the starship crew has been eaten by an alien monster — and it will soon be dinner-time again. A graphics display shows any life forms on the same level — the ship has three levels — so you can watch the alien move closer.

Another display shows what exits are possible from the room or corridor you are in, and a third display shows what you have been able to load into your space shuttle craft, which is your only hope of escape. Food, water, oxygen, weapons and other



useful objects are scattered around.

On the other side of Alien Intruder is **Hieroglyphics**, a clever variation of Hangman, in which a 39-symbol ancient



alphabet has to be deciphered before the famous explorer, Wullie Makeit, is buried in sand. Both programs make good use of graphics and words to make a very entertaining package.

Wumpus Adventure features the most ancient and terrible creature of computer mythology. You must track the Wumpus by its smell and chilling cry through a maze of caves containing a host of terrors.

Goblins may catch you and tie you up as a morsel for their god, the Wumpus; bats may pick you up and drop you in another cave, which may contain a bottomless pit or a giant serpent — or only a swamp if you are lucky. Up to four players can take part and if you happen to step into Wumpus muck, one of the other players may smell you and fire an arrow at you, in mistake for the monster.

With Wumpus Adventure there is **Movie Mogul**, which gives a taste of the trials and tribulations of Hollywood. See a day's filming go down the drain when the leading actor punches the leading lady in the mouth; try to balance location and studio filming, while keeping in mind the current fashions among the movie buffs. Wumpus and Mogul are two good non-graphics programs to keep you off the beach for hours.

Volcanic Dungeon/ Hangman costs £4.50 and the other two tapes are £5 each, plus 50 pence p&p, from R Carnell, 4 Stainton Road, Slough, Berkshire.

Asteroids in the home

INSTEAD of waiting for the amusement arcades to open, the Electronic Pencil Co **Asteroids** brings home the action. It has nearly all the features of the 20 pence guzzlers; one or two players, four sizes of asteroids, hunter-killer alien spaceship and on-screen scoring. There are five levels of play and the top five scorers have their names displayed.

Written in 100 percent machine code, Asteroids costs £3.95 from the Electronic Pencil Co.

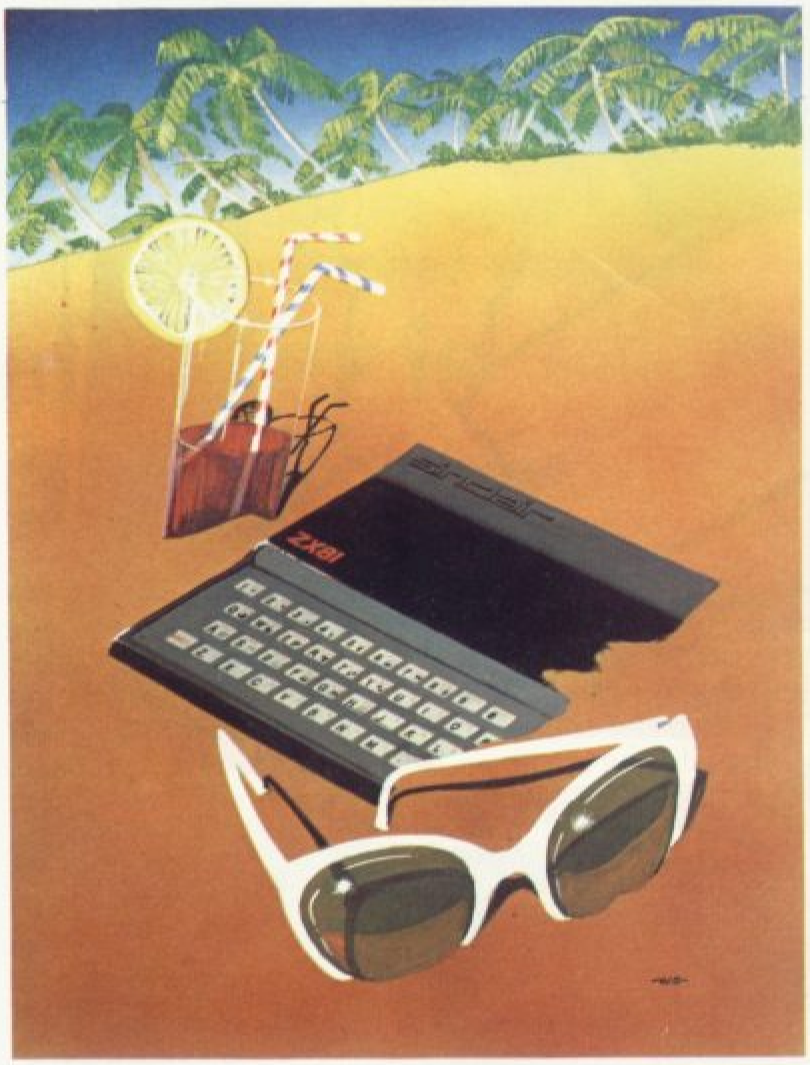
Machine tools

MARTIN Wren-Hilton, the U.K. correspondent of the American *Sync* magazine, has taken time from his A level studies to produce two remarkable machine code programs for 16K ZX-81s. The first, **Super-Zap**, sounds like yet another space invaders game but is in fact a separate loading and saving routine, entirely distinct from the routines in the Sinclair ROM.

Many machine code programs now available start running automatically after loading and since they often use their own keyboard scanning routines, they do not respond to the Break key. Wren-Hilton wanted to be able to look at those

continued on page 16





continued from page 15

programs and see how they worked, so he developed Super-Zap, which loads the program byte by byte into a Basic array, so that it can be examined without running it. That array can then be saved on tape, either in its original format so that it auto-runs on loading, or in a super-zapped format, in which case it does not.

Wren-Hilton's second program is **Lower Case**, which allows mixed upper- and lower-case letters to be output to the printer. The program re-sets RAMTOP and stores its 1½K of machine code above it. A simple USR call operates the special Copy routine, which turns any inverse characters on the screen into lower-case on the printer. True descenders occur as required and the routine runs as quickly as the normal copy. The number of lines to be copied can be altered with a POKE and the routine has a typing program developed by a satisfied user.

Super-Zap and Lower Case cost £4.95 each from Martin Wren-Hilton, 4 Little Poulton Lane, Poulton-le-Fylde, Nr. Blackpool, Lancs FY6 7ET.

Silversoft arcade

THERE ARE two more programs from Silversoft in case you caught the arcade itch at the seaside. **Asteroids** has three sizes of asteroids, left and right turn, fire and thrust controls. There are 10 levels of play from soppy to suicidal, with bonuses for knocking-out the motherships. On-screen scoring and high score make this a good all-machine-code version of the game for £5.95.

Space Invaders is the closest yet to the arcade original. It has 10 levels of play, command ships, plenty of bombs to dodge, smooth machine code action, on-screen scoring and high score. Like the original, when you reach the last few invaders they start moving faster, so a steady hand and a good eye are required. If you manage one screen, the next group start one step further down.



As an extra bonus, the program includes the software necessary to run the Quicksilva character generator, for even more realistic invaders action. It costs £4.95 from Silversoft, 40 Empress Avenue, Ilford, Essex.

Playing for high stakes

IF YOU have decided on Littlehampton rather than Las Vegas for your holiday this year, you can still taste the high stakes action with two 16K programs from Newline Software. **Three Card Brag** lets you start with £100 which you put into the pot and your cards are dealt. Then it is for you to decide whether you fold, brag — raise the stakes — or pay to see the computer hand. The ZX-81 has the same options and the pot may soon become substantial. The rules are simple and the game addictive but if you decide that the computer is cheating, please do not shoot it, as that is extra ventilation it can do without.

The second program is the American dice game **Craps**, which also has simple rules and high stakes. One to four players or shooters can pit their nerve against the random fall of the dice, taking it in turn to try to make a natural while avoiding snake eyes, which is craps — and you thought computer jargon was complicated?



The programs have excellent full-screen graphics and cost £5.50 and £3.95 respectively, from Newline, 8 Ewell Rd, Wollaton, Nottingham NG8 2DE.

ZX99 AUTOMATIC TAPE CONTROL

The logical extension for the Sinclair ZX81 giving data retrieval & word processing

£59·95 plus P&P

The ZX99 Tape Control system is a sophisticated extension to the Sinclair ZX81 Microcomputer, providing remarkable additional capabilities, which allow both the beginner and expert access to a professional computing system without the expected expense.

✱ DATA PROCESSING

The ZX99 gives you full software control of up to four tape decks (two for reading and two for writing) allowing merging of data files to update and modify them. This is achieved by using the remote sockets of the tape decks to control their motors as commanded by a program.

✱ PRINTER INTERFACE

The ZX99 has a RS232C interface allowing you direct connection with any such serial printer using the industry standard ASCII character code (you can now print on plain paper in upper and lower case and up to 132 characters per line.)

✱ MANY SPECIAL FEATURES

There are so many different features that it is difficult to list them all:

For example:

AUTOMATIC TAPE TO TAPE COPY: You can copy any data file regardless of your memory capacity (a C90 has approx 200K bytes on it) as it is loaded through the Sinclair block by block.

TAPE BLOCK SKIP without destroying the contents of memory.

DIAGNOSTIC INFORMATION to assist in achieving the best recording settings.

✱ TAPE DRIVES

We supply (and guarantee its compatability) a Tape Drive that works with your computer.

✱ COMPUTER CASSETTES

We supply quality (screw assembled) computer cassettes. Please enquire for any not shown:



The ZX99 contains its own 2K ROM which acts as an extension to the firmware already resident in your ZX81'S own ROM. The ZX99's ROM contains the tape operating system, whose functions are accessed via Basic USR function calls. Each function has an entry address which must be quoted after the USR keyword. All of the functions can be used in program statements, or in immediate commands (i.e. both statements with line numbers and commands without them).

There is an extension board on the rear to plug in your RAM pack (larger than 16K if required). The unit is supplied with one special cassette lead, more are available at £1 each (see below).

COMPREHENSIVE USER MANUAL INCLUDED IN PRICE

✱ ZX99 SOFTWARE ✱

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Colour for Scisoft maths

ANNUAL subscriptions for *Sinclair User* and *Sinclair Programs* are among prizes being offered in a competition for the under-11s. The winner will be the child who does the best colouring of the cover of the **Jungle Maths** cassette which is produced by Scisoft, the educational software house.

The competition is being run jointly by Scisoft and Microware, the Leicester software and hardware retailer. As well as the subscriptions, the winner will receive a Microware voucher.

Entry forms will be given with a copy of the cassette. Entries close on September 30 and the winner should be announced in the December issue of *Sinclair User*.

Northern fair 'a disaster'



Mike Johnston

THE FIRST computer fair for hobbyists to be held outside London was a "disaster". That was the verdict of the majority of exhibitors at the ZX Microfair in Manchester.

A variety of reasons were advanced, including the visit of the Pope to Manchester the following day; 'the bright warm Bank Holiday weather'; it was held at the wrong time with the Spectrum hanging over the market; and it was staged at the wrong venue with the New Central Hall being on the wrong side of the city, where parking was a problem. The result was that 2,000 people visited the show and spent little money there.

"I think it reflected the state of the market and there were a few things which went against it," said the organiser, Mike Johnston. "We had about 2,000 people compared to between 5,000 and 6,000 at the London shows but we are not talking about the same catchment area and if we had held it only on one day, the attendance would have been reasonable.".

A major criticism from exhibitors was that the show had not been given sufficient publicity. Sue James of Microware in Leicester said that in her company's advertisement in *Sinclair User* in June the Manchester Microfair was mentioned and the company had received many calls from people who had not known about it.

Johnston replied: "It received the same amount of coverage as the previous London shows, when we were criticised for having too many people."

He added that he had not been deterred from organising fairs and would be holding another.

The experience of Manchester does not appear to have influenced companies unduly from exhibiting at shows outside London. The next two provincial shows were both reporting a high level of interest.

Gordon Hewit, a committee member of the Edinburgh ZX Computer Club, which held a fair in July said that many exhibitors disappointed with the Manchester show had turned to them in the hope of doing better.

"They see Scotland as a more fertile area and, with Edinburgh being a good centre of communications, we can attract people from all over the centre of Scotland," he said.

On the same weekend Microfest 82 was held in Manchester.One of the organisers, Dave Hewitt, said that many of the people had wanted to take space because it seemed to be better organised.

ZX-81 taking off in the States

THE ZX-81 is beginning to take off in the States. An agreement between Sinclair Research and the American Express credit card company has resulted in a flood of orders for the machine.

The credit card company sent a direct mail offer to its two million cardholders in the U.S. at the end of May. In what Sinclair Research calls "a very positive response", 2,000 orders were received by noon the day following the offer. In the first three weeks more than 25,000 orders were sent to American Express.

Total sales from the offer have been forecast at 50,000 units and it is thought that may be a conservative estimate.

The offer was agreed between American Express and Sinclair Research following a succesful test marketing for the ZX-81 at the end of last year. The test market had been requested by the credit card company.

The deal does not affect the plans by Timex to market its enhanced version of the ZX-81, the Timex Sinclair 1000, which has a 2K RAM instead of the normal 1K. That will not be on sale until this month and Sinclair Research in the U.S. is continuing to sell the ZX-81 until the Timex sales reach a certain level.

Sales of the ZX-81 were 15,000 a month in the U.S. in the early part of the year and it is estimated that 435,000 have been sold throughout the world.

Sales in Britain declined in April but are said to have recovered in May. The machine is being promoted in new markets. Sales are going well in France and reasonably well in Germany and increasing in other markets.



Spectrums six weeks late

ALMOST two months after the launch in a blaze of publicity at the Earls Court Computer Fair in April, Spectrums at last were being delivered in June. The delivery dates being quoted at the launch were a confident two weeks for the first orders. According to Sinclair Research, the initial delay was caused by the time needed to have production running smoothly.

When the first batch of 16K machines was ready eventually for despatch at about the beginning of June, a design fault was discovered. No-one is saying what the fault was but Bill Nichols, Sinclair Research public relations officer, said: "It was a very obscure fault which would not have shown up 80 or 90 percent of the time."

Once that had been dealt with, there was a distribution dispute at Timex. Nicholls added that delays of between six and eight weeks were likely for people who had ordered by the first week in June. After that, delivery should be down to the standard 28 days.

Lending software

A NEW software library has been set up to allow Sinclair users to take advantage of the many items on the market without having to buy the cassettes.

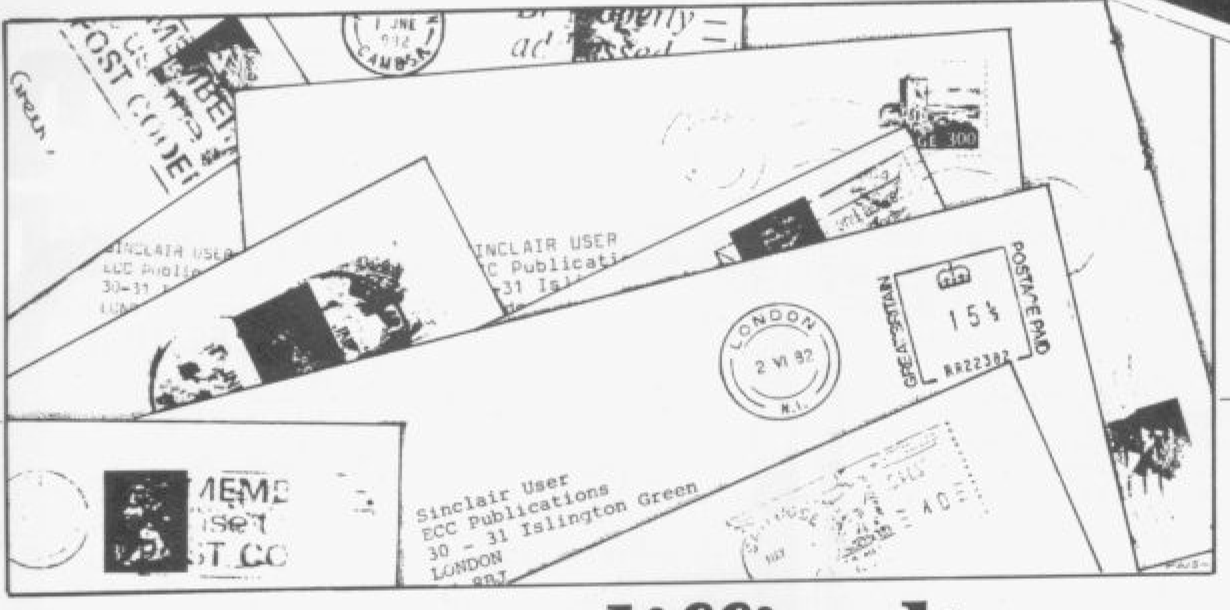
Membership of the Sinclair Owners' Software Library costs £5, which includes the hire of the first cassette. Subsequent tapes can be hired at £1 for three weeks.

A quarterly newsletter is also sent to all members, with details of new additions to the range. The subjects covered include games, educational and toolkit programs.

Sale may raise £10m

SINCLAIR Research has passed the first hurdle in the planned sale of shares in the company. It has passed the preliminary audit commissioned by the merchant bankers, N M Rothschild, and the sale is expected in the autumn.

Rothschild is arranging the final details, which are likely to involve selling to chosen City institutions 10 percent of the company. It is expected to raise at least £10 million, which would put a valuation of £100 million on Sinclair Research but the figure raised could be £20 million.



Contest too difficult

I AM writing to complain about the competition in your June issue. What annoys me most is that the amount of people entering this competition is limited to those who have a fair amount of knowledge about electronics and computers, and that must surely be a small percentage of your readers.

As this is a magazine for all Sinclair users, surely a competition which everyone could enter would be more appropriate?

Admittedly, the Spectrum is an outstanding prize but if it is so good, why not give everyone a chance of winning one?

Despite the complaint, I think your magazine is excellent, so continue the good work.

Philip Morris,
Langford, Nr Bristol

• *There are two reasons why we decided to base the June competition on a hardware application. The previous two had been for software and we thought it better to set something for those with an interest in hardware. Second, we do not share your view that people with a knowledge of the electronics of computers comprise only a small percentage of our readership.*

Character error

HAVE YOU noticed that CHR$ 7 and 135 are printed as the same character in the ZX-81 manual and that the graphics character on KEY 3 is missing?

I have found out that the missing character has the code 135 and that the one printed is wrong. The character with code 135 is =.

Mark Colson,
Horncastle, Lincs.

Misprint problems

SEVERAL MONTHS ago I finally bought a ZX-81 and promptly set about mastering the manual. All went well until I reached page 129, Exercise 4, prophetically entitled "This one will drive you mad". Try as I might, every time I entered the program and tried to run it, I would be greeted with error code 5/90 or 5/150, or 5/210 if I pressed "Q".

After some thought, it occurred to me that the lines of the program the machine was trying to execute when the report codes appeared were all PRINT statements. That meant the machine was trying to execute those commands but had insufficient screen space to do so.

The next thing which occurred to me was that a SCROLL instruction had gone wrong somewhere, so I then set about jamming-in extra scroll statements where I could. Finally, I found that 42 SCROLL made the program work.

When I wrote to Sinclair to point this out, the answer arrived with commendable speed to the effect that there was a printing error in the program and that line 40 should be terminated with a comma. In fact, that makes the program run much prettier than my alteration.

The point is that I have never seen in your or any other publication any reference to the error and that is curious — because 250,000 people have not noticed it, or 250,000 people have ignored it, or 250,000 people have achieved such a level of programming ability by page 129 that they thought it beneath them to draw attention to it.

The reason I am writing is to pose the question if there are other misprints of which we are unaware? At the very least, I think that it would be very user-friendly of Sinclair to mail a list of errata to all purchasers, so freeing people like myself of a good deal of head-scratching.

Finally, a good test of pocket calculator accuracy over a series of functions is to find the Sin of 45 degrees, then find the Cos, Tan, ArcTan, ArcCos and ArcSin of each successive result, hoping that it will yield the answer 45 degrees again. In my experience, Casio calculators, for example, yield an error of half a percent while Sinclair calculators yield an error of 33 percent. Try it on the ZX-81, using a program of the kind 10 INPUT A, 20 PRINT A, SIN A, 30 LET B=SIN A, 40 PRINT B, COS B and so on. Note that 45 degrees must be converted to Pi/4, as the ZX-81 works in radians, and 45 cannot be handled. Try a few values and you will be amazed and aghast alternately at the results.

M P Campbell,
St Ives, Cambs.

RAM pack price falls

I AM writing about *Sinclair User* June, 1982. On page 5 you state that the Sinclair RAM pack has been reduced to £30. On page 10 you say the cheapest RAM pack is that of AVC Software at £32.50.

On pages 20, 42, 54 and 60, you advertise RAM packs for less than £30.

David Clifton,
Beckingham,
Doncaster, S. Yorkshire

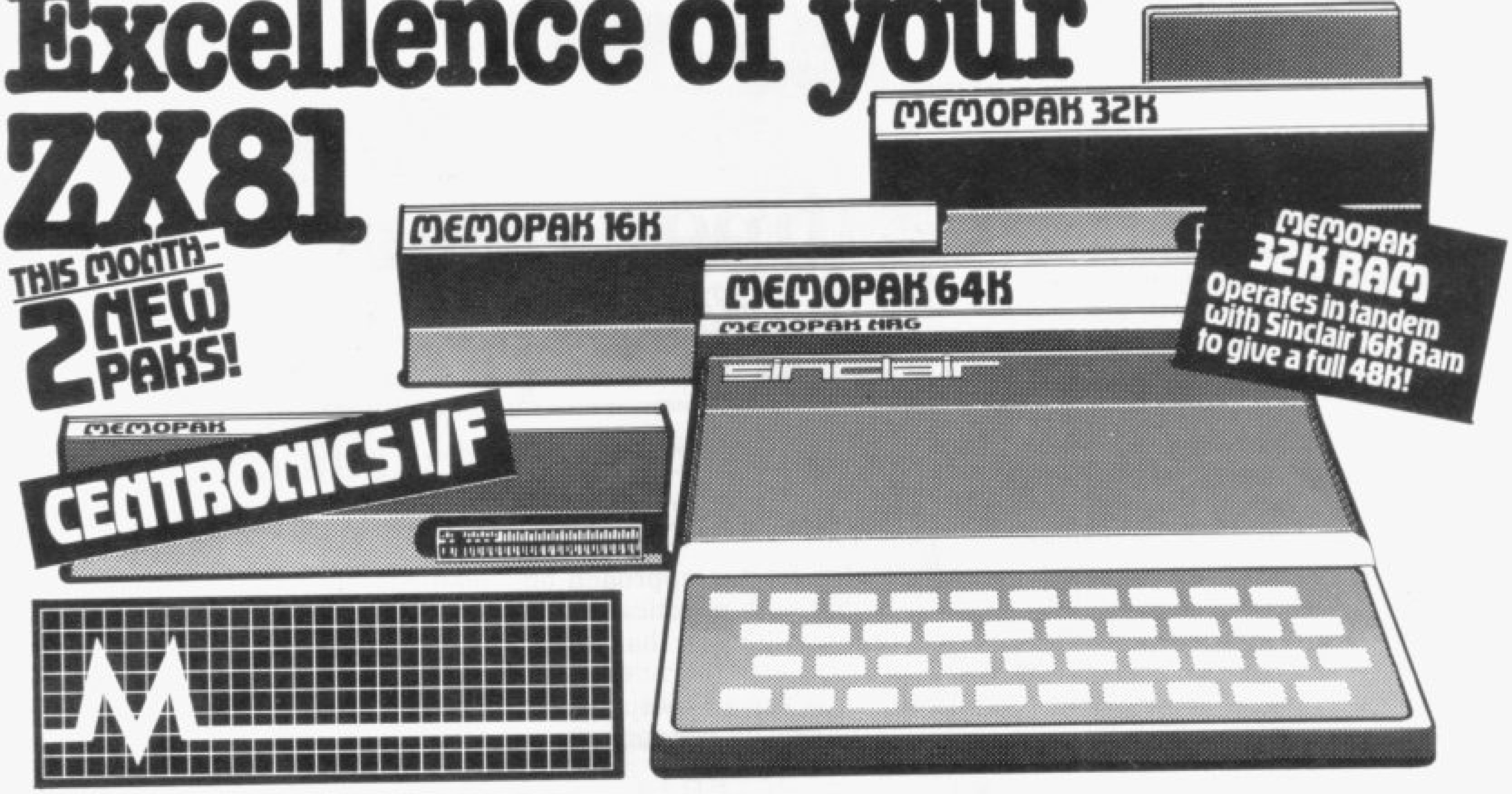
Searle corrects

THE JUNE issue of *Sinclair User* contained an article about me by Elspeth Joiner. The article was based largely on an interview conducted on April 7, 1982, prior to the launch of the Spectrum personal computer. In the article I am quoted as saying that Sinclair Research Ltd will launch another small computer this year. I was, in fact, referring to the then imminent ZX Spectrum.

Sinclair Research Ltd has no plans to announce new personal computers in 1982.

Nigel Searle,
Head of Computer Division,
Sinclair Research Ltd,
Cambridge

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The 64K Memopak extends the memory of the ZX81 by 56K, and with the ZX81 gives 64K, which is neither switched nor paged and is directly addressable. The unit is user transparent and accepts commands such as 10 DIM A(9000).

Breakdown of memory areas...0-8K-Sinclair ROM. 8-16K-This area can be used to hold machine code for communication between programmes or peripherals. 16-64K-A straight 48K for normal Basic use.

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These two packs extend and complete the Memotech RAM range (for the time being!) A notable feature of the 32K pack is that it will run in tandem with the Sinclair 16K memory extension to give 48K RAM total.

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Getting a quart into a pint pot

D.J. Todorovic considers data code compression by changing character codes

THE IDEA of data code compression is certainly not new, as it has been used in various forms for a long time in mainframe computers. The process of increasing the number of valid and unambiguous data characters which can be stored in a given memory area can be achieved either by reducing the number of bits used to describe each data character — i.e., by changing the character codes or by reducing the number of redundant and insignificant data characters such as space characters.

The routines described are one example of a former approach on the ZX-81 but with practical value on machines with more than 1K of RAM.

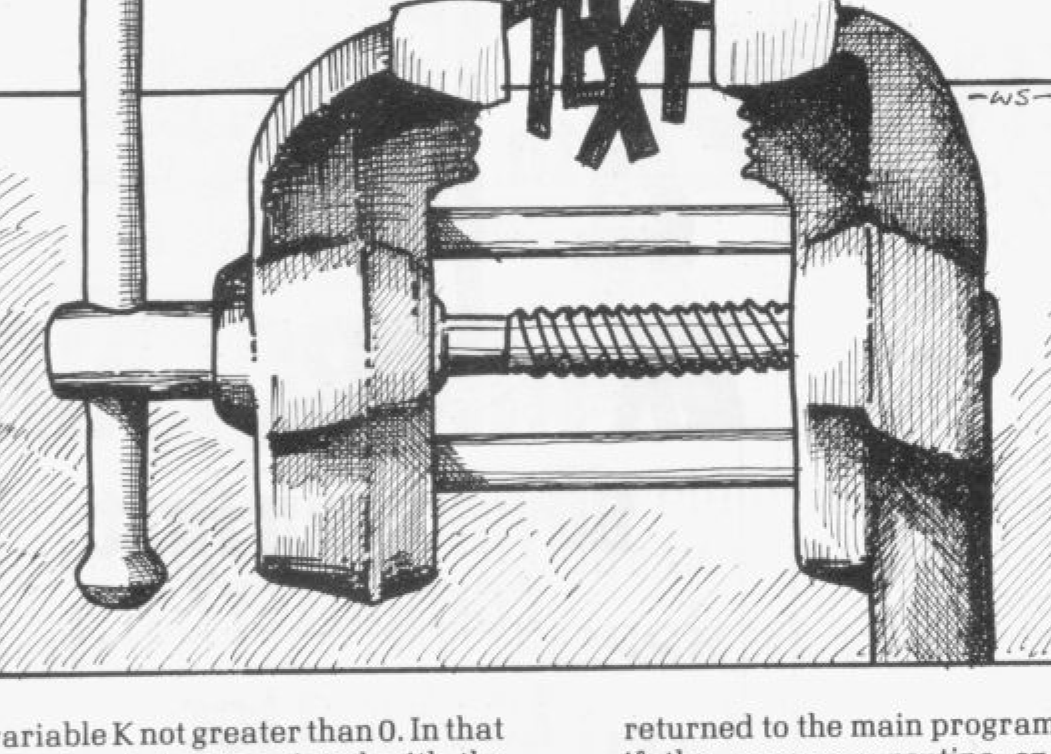
As it is true for all compression methods, there must be a kind of trade-off. In this case, besides the increased processing requirements due to the existence of compactor routines, there is also a serious restriction on usable character set; usable set is limited to 39 characters, including letters A-Z, digits Ø-9, two special characters — comma and period — and a space. All other characters, including special, graphic and inverse characters, are illegal and are flagged as such if submitted to the compression routine.

On the other hand, compactor routines are providing the compression ratio of 2:3, so the compressed text will occupy only two-thirds of the area required by the original text. Bearing in mind character-set limitations, the routines either may reduce the required memory area or provide a 50 percent increase of usable text length.

As the space savings should be greater than the space occupied by compactor routines — 314 bytes for compress and 282 bytes for expand — the approach is beneficial only on larger amounts of text data — more than 2,000 characters — as such programs compactor routines might improve significantly the space utilisation and increase the amount of text stored.

The test program shown in figure one, up to line 140, is only to demonstrate compactor routines and to print the results after each step. It will solicit the input string text and the operation may be terminated by inputting "BYE". It also contains a small error routine, which is used only if the input text contains an invalid character — i.e., return from compress routine with

```
  10 REM **ZX81 TEXT COMPACTER**
  20 REM C GTN 1982
  25 LET K=1
  30 INPUT T$
  40 IF T$="BYE" THEN STOP
  50 PRINT "TEXT: ";T$
  60 GOSUB 8005
  70 IF K>0 THEN GOTO 110
  80 PRINT "ERROR ";T$
  90 PRINT TAB (6+B+C);"GRAPHIC
?"
 100 GOTO 30
 110 GOSUB 8205
 120 PRINT LEN C$;" CH. COMPRESS
ED: ";C$
 130 PRINT LEN T$;" CH. EXPANDED
: ";T$
 140 GOTO 30
8000 REM **COMPRESS ROUTINE**
8005 FAST
8010 LET C$=""
8020 LET T$=T$+"(DOUBLE SPACE)"
8030 FOR C=1 TO LEN T$-2 STEP 3
8040 LET X=0
8050 FOR B=0 TO 2
8060 LET K=CODE T$(B+C)
8070 LET K=1+K*(K>25 AND K<64)-2
5*(K<>0)
8080 IF K<=0 THEN RETURN
8090 LET X=X+K*40**B
8100 NEXT B
8110 LET C$=C$+CHR$ (X/256+.5)+C
HR$ (X-256*INT (X/256))
8120 NEXT C
8125 SLOW
8130 RETURN
8200 REM **EXPAND ROUTINE**
8205 FAST
8210 LET T$=""
8220 FOR C=1 TO LEN C$ STEP 2
8230 LET X=256*CODE C$(C)+CODE C
$(C+1)
8240 LET X3=INT (X/1600)
8250 LET X=X-X3*1600
8260 LET X2=INT (X/40)
8270 LET X1=X-X2*40
8280 LET T$=T$+CHR$ (X1+24 AND X
1-1)+CHR$ (X2+24 AND X2-1)+CHR$
(X3+24 AND X3-1)
8290 NEXT C
8295 SLOW
8300 RETURN
```



variable K not greater than 0. In that case input text is printed with the invalid character flagged underneath with an inverse "?".

Routines for text compression at line 8000 and expansion at line 8200 are both designed to operate in FAST mode and revert to SLOW just before returning to the main program. By omitting lines 8005, 8125, 8205 and 8295, the operational mode of these routines will be as set in the main program. Compactor routines use the following variables:

- T$ — string which contains the original text, as an input for the compress routine, or the expanded text, as an output from the expand routine.
- C$ — string which contains the compressed text as an output from the compress routine or an input for the expand routine. Note that PRINT of this string may be unreadable and look longer than the original text, depending on the bit pattern obtained in the compression, which may produce any of the ZX-81 character codes.
- C — current token position within the original text.
- B — current position within a text token — three characters from the original text.
- K current valid character code. There are 39 valid characters mapped starting from 1 for space and values 2 to 39 are assigned for ZX-81 characters from comma to Z. Values equal to or less than zero are returned to the main program if the compress routine encounters an invalid character on position B + C from the start of the original text. Note that this variable must be preset to 1 in the main program — line 25 — before calling the compress routine to cope with empty input text.
- X, X1, X3, X3 — used in the transformation process to calculate character codes.

The 0.5 offset which is used in line 8110 is to provide the correct rounding-up for the CHR$ function. Also note in line 8280 the use of logic AND, which would provide expansion with 1 mapped as a space character. Use of the logic function is also obvious in line 8070, where different non-contiguous values are assigned to •ariable K.

```
   26 LET S$="(SPACE)"+"012345678
9ABCDEFGHIJKLMNOPQRSTUVWXYZ,."
   70 IF K<40 THEN GOTO 110
8060 FOR K=1 TO 39
8070 IF T$(B+C)=S$(K) THEN GOTO
8090
8080 NEXT K
8085 RETURN
8280 LET T$=T$+S$(X1)+S$(X2)+S$(
X3)
```

When the character set is not entirely satisfactory there is a possible modification, shown in figure two. This is the solution used normally on ASCII-coded machines — remember that ZX-81 is not — and involves the use of a conversion string SS. That is a user-definable string which also contains 39 characters — as the previous restriction still holds — but it is possible to put in any combination of characters, which therefore are declared as a valid set for compactor routines.

To optimise the transformation process, more-often-used characters should be placed at the beginning of the string SS. String S$ as defined on line 26 of figure two is using the same valid set as the routines from figure one. There are also some changes in the compress and expand routine but the solution from figure two would require the definition of the string S$ in both programs, if the compress and expand routines are used in separate programs.

The idea of text compacting as shown in figure two might be enhanced and the valid character set enlarged by making S$ the string array. Of course, as we need some additional indexing within that string array which will enable switching from one string array element to the other, it will be at the expense of the compression ratio, which will be less effective.

The routines can be used to compress text data which is to be stored together with a program on the cassette and are therefore very usable in programs handling directories and indices. It is also possible to handle in a similar way the read-only text as, after entering it, compressing and storing in arrays, such programs do not need the compress routine. So before such a program is saved on the cassette, the compress routine may be deleted, as in normal use the program will need only the expand routine to prepare the data to be PRINTed.

Besides further savings in memory space, this method provides additional security benefits, since the LOADed program will contain text data which cannot be modified easily without the compress routine.



Come to the ZX-81 with a clear mind to make the best use of your new machine.

Lifetime's obsession can easily be acquired

BUYING a ZX-81 can be the start of a lifetime obsession with home computing. It is easy, however, to become discouraged if everything does not go to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the ZX-81 is to abandon any ideas for special uses. While the basic machine is ideal for learning how to use computers, it is too small for any major uses. It is better to become accustomed to the many facilities and then decide how you wish to ue them.

Begin by unpacking the machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for a second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

Once the K appears you are ready to begin learning about the ZX-81. It can save family arguments if you can afford a separate television set for your system. It also makes life easier if you can find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

The manual is written in great detail and is reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something which is important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are really ready but that is likely to lead to errors. For example, words like AND, THEN, and AT should not be typed-in letter by letter. By the time you have reached chapter 11, you should have accumulated sufficient knowledge to be able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important that when using the machine it is not jolted. Some of the connections can easily work loose and everything which has been put in will be lost.

The manual is not to everyone's taste and if you find it difficult to follow, a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing, you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy. There are some programs for the unexpanded 1K machine but most of them require a 16K RAM pack. The tapes vary in quality. It is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about the ZX-81 is to plunge in at the deep end and see what the computer will do. Refer to the manual when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machine.

You may have heard already about the problem involved in SAVEing and LOADing your own cassettes. The manual again gives detailed instructions but many of the early machines would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

They usually occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD" " followed by NEWLINE; then slowly increase the volume of the recorder with the tape running until the television screen shows four or five thick horizontal black bands. If you then re-wind the tape, the program should LOAD normally.

Finally, a health warning. Apart from any practical uses, computing with your ZX-81 can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning, thinking that in another five minutes you will sort out the problem.

Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a ZX-81 you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours with your Sinclair machine.

FULLER FD SYSTEM £39.95

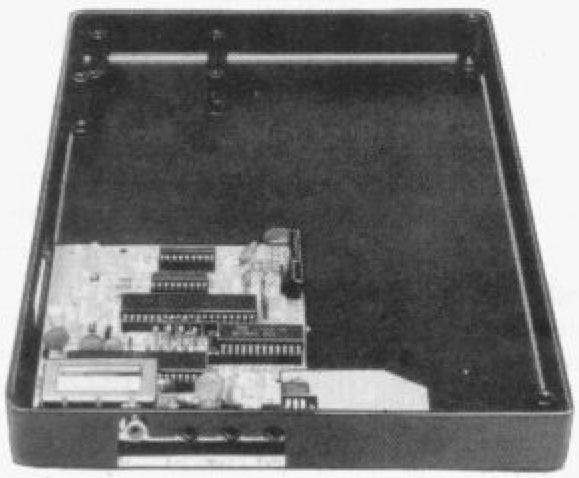
Professional Keyboard & Case for Sinclair ZX81 & ZX Spectrum

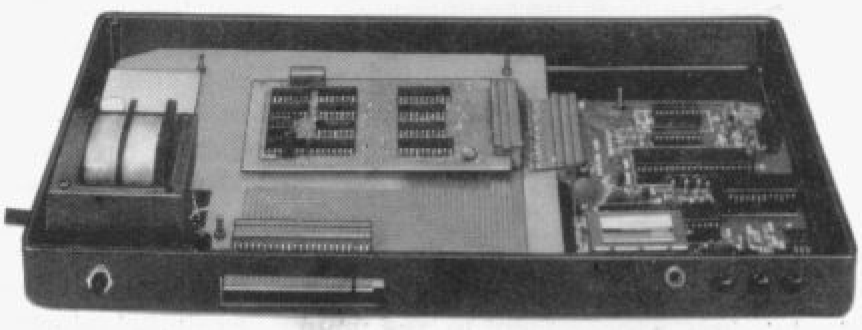


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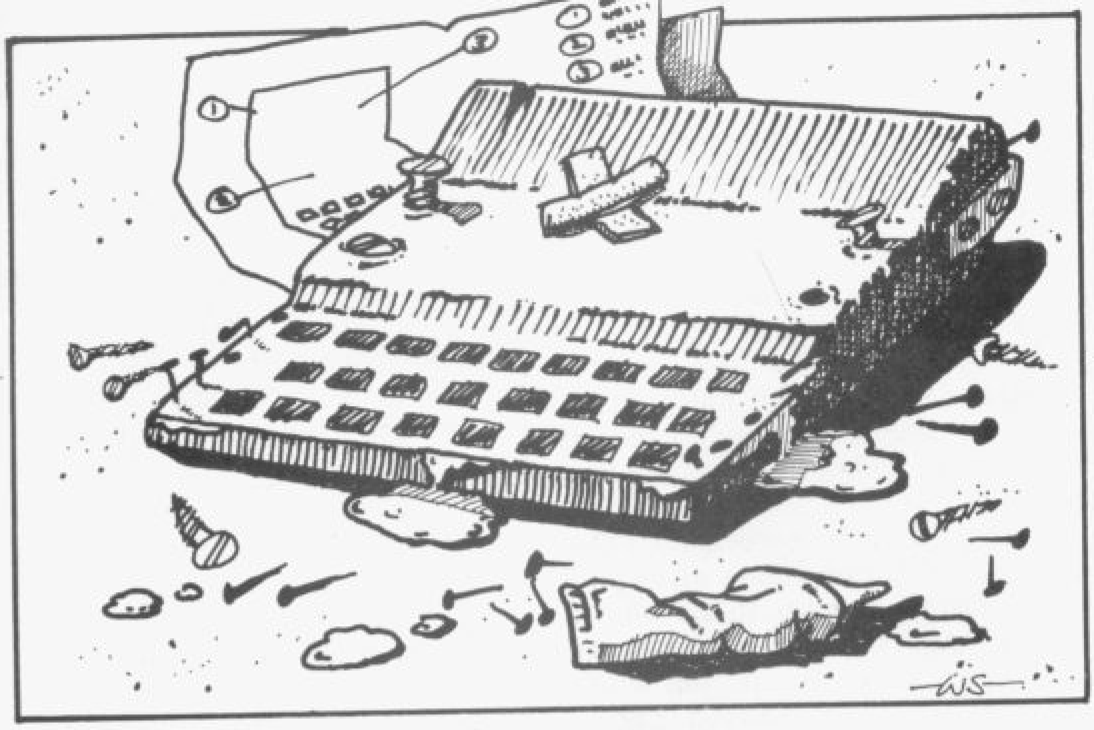
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Phil Garrett looks at routines which can assist in writing tidier systems.

Basic toolkits can help put polish on programs

WHEN I discussed reviewing ZX-81 utility programs with the editor, he was disappointed that all the debug programs operate only in machine code and that the Basic programmer is left to sink or swim. While it is true that there is nothing available to help unravel the mess of tortured logic in which my Basic programs finish, there are several programs which add extra facilities as they are written, and can make them look neater afterwards.

Even a program which is a jumble of embedded subroutines and GOTOs every other statement looks well-planned when all the line numbers increase in tens. Re-numbering is probably the main reason for the purchase of a toolkit program and is the only function included in every one at which I looked. The range of other functions offered is very wide and some of them seem to have been put in just to make a program appear more substantial, rather than because they are useful.

Hewson Consultants offers two programs, a straightforward **Renumber** and a more sophisticated **Toolkit**. Both can be used on ZX-81s with either the standard 16K RAM or with the increasingly-popular 48K and 64K RAM packs. They require the user to re-set RAMTOP before the program is loaded, which can be annoying, especially when you forget to do it.

Renumber takes 1K and a USR call re-numbers your Basic program in steps of five, starting from 5. Other values for the step size and starting number can be POKEd in and it will always re-number to the end of the program. The routine took about 50 seconds in Fast mode to re-number 5K of Basic.

A problem with which all the re-numbering programs have to cope somehow is the very useful but very non-standard Sinclair GOTO — and GOSUB. Our GOTO 1000 + 100*A and GOSUB X are seen in few, if any, other dialects of Basic, and are too sophisticated for a re-numbering program to cope with, so have to be tinkered with afterwards.

Another non-standard feature is the jump to a non-existent line number; Sinclair Basic simply continues looking until it finds a line, whereas most Basics will stop with an error if the line does not exist. A measure of the usefulness of a re-numbering program is what assistance it gives to the programmer in resolving those difficulties.

To return to the Hewson Renumber, computed GOTOs and jumps to non-existent lines are highlighted in reverse video after re-numbering. The arithmetic expressions — e.g., GOSUB 1000 + INT (10*RND + 1) — can appear rather distorted, so it would be as well to have a copy of the original program to which to refer.

Hewson's Programmers' Toolkit requires 3K above RAMTOP and includes routines to copy or delete blocks of Basic lines and a number of machine code monitor functions. The re-number works in much the same way as the previous program, except that an end number can also be given; the numbers are prompted for, rather than having to be POKEd in. The Toolkit seems to consist mainly of lines of Basic starting from 9000, which are added to your own Basic program with a USR call. RUN 9000 will then run the Toolkit, which displays a menu of functions. There is a hexadecimal loader and lister and a routine to copy bytes from one place to another. More useful are the functions which can display the line numbers of lines containing a particular string of characters or tokens you want to find — e.g., computed GOTOs — and REPLACE, which allows a string of characters to be exchanged for another of equal length. Both routines are slow to execute.

I did not find the program very robust; the hex lister did not work, the re-number duplicated line numbers when I set the increment too large, and the program crashed several times. The instructions for both programs are brief, but adequate. Renumber costs £4.95 and Programmers' Toolkit £6.50.

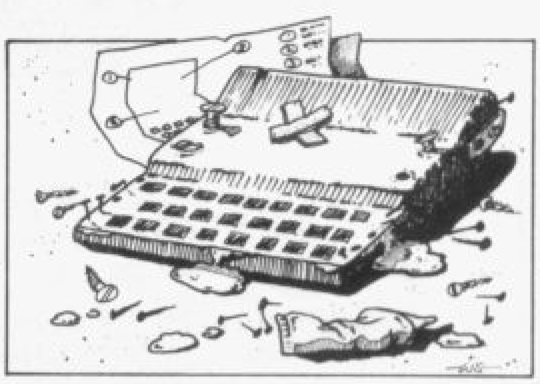
The JRS Software Toolkit also requires the user to re-set RAMTOP and takes 1K. A great deal has been packed into that 1K but ease of use

continued on p30

> 'All re-numbering programs have to cope with the very useful, but very non-standard, Sinclair GOTO and GOSUB.'







continued from p.29

seems to have fallen by the wayside. The re-number requires all statements such as GOTO 25 to be changed to GOTO 0025 before it will work. Computed GOTOs and jumps to non-existent lines are ignored completely. Starting line and increment can be changed with POKEs and the routine took eight seconds to re-number 5K.

There is a search-and-list function which could be used to find all occurences of GOTOs and GOSUBs, so that they could be changed to the required format. There are also search and replace and memory left routines, plus three graphics routines, Hyper graphics mode alters the start address of the ZX-81 ROM character table and produces interesting but useless effects; Fill fills a specified number of lines with a chosen character; and Reverse inverts as many lines on the screen as required.

At £4.95 the program demands a great deal of care and effort from the user, which surely is not the purpose for which utility programs are intended.

The ACS Software **Progstore** allows a small — fewer than 2,750 bytes — Basic program to be stored above RAMTOP. The program can then be called, with USR, and acts rather like a subroutine. Any variables used in the stored program must already exist.

On the other side of the tape are four small Toolkit programs which can be used with Progstore. **Hexloader** and **Hexlister** are obviously fillers and a waste of time; no addresses are shown, so it is difficult to interpret what appears on the screen. **Progmod-1** allows larger programs to be stored above RAMTOP by modifying Progstore. **Renumber** works only in steps of 10 from line 10 and, incredibly, the entire program will crash — and I mean a complete crash, not just stop — if it encounters a computed GOTO or jump to a non-existent line number.

The other ACS cassette contains **Progmerge**, which allows all or part of a Basic program to be stored above RAMTOP and then merged with a second program, the whole lot then being re-numbered. The instructions did not indicate what size of program could be stored and a 3K program I tried was too big. The re-numbering, which can be run on its own, has the same limitations as the toolkit Renumber.

I was impressed with the ACS assembler and disassembler programs and so I was surprised at the poor quality of its re-number routine, which could be used only with the utmost care. The instructions are clear, with helpful examples. Progstore/Toolkit costs £7.50, and Progmerge £5.50.

ACS, however, has now brought out **Progmerge (version two)** which is said to have overcome the problems. The program costs £5.50 and anyone with the first version who wants it updating can have it done by ACS at a cost of £1 plus 25p for postage and packing.

'ZXED is a most impressive program, fast in execution, with clear and full instructions and helpful error codes'

At 4K, the dK'tronics **ZXED** toolkit is bigger than the others and re-sets RAMTOP automatically. The program is controlled from six lines of Basic 9990-9996 which are added to your program with a USR call; RUN 9990 starts the toolkit and gives an inverse E prompt, waiting for one of 11 commands. Whichever is chosen, full prompts are given and, if anything goes wrong, 10 special error codes will identify why and where it happened.

Renumber prompts for start and end line numbers, new base and increment. It then looks through the Basic and if it encounters a computed GOTO it will stop with report "Q/line no.". The user can then insert a REM into the offending line and continue with the re-numbering. Impressively, jumps to non-existent line numbers will be re-numbered correctly e.g., 5 REM 15 REM 25 GOTO 10 will become 10 REM 20 REM 30 GOTO 20. It took less than one second to re-number 5K of Basic.

Find will display the lines — not just the line numbers — containing a specified string, so it can be used to find the REM GOTO X lines after re-numbering, and Alter will replace a string. Blocks of lines can be copied, moved or deleted, stored above RAMTOP and re-inserted into another program. Bytes tells you the amount of free memory remaining.

It is a most impressive program, fast in execution, with clear and full instructions, and helpful error codes. At £6.95 for the cassette version and £9.95 for an EPROM version, it stands out from the rest of the field.

Unfortunately I was unable to load the last program, the Bug-Bytes **ZXTK** and the replacement copy arrived too late to be included in this review, which is a pity as it has some unusual functions. Sniff displays the file names of programs on a ZX-81 tape — that is useful if you've forgotten them; Where gives the address where a Basic line starts in memory; Rem creates a REM statement of specified length; Check generates a check number to ensure a program has loaded correctly. In addition, it has Renumber — which highlights computed and non-existent line GOTOs — Copy, Move, Extract — place above RAMTOP — and merge blocks of Basic. ZXTK costs £6.

Hewson Consultants, 7, Grahame Close, Blewbury, Didcot, Oxon OX11 9QE.
JRS Software, 19, Wayside Avenue, Worthing, Sussex BN13 3JU.
ACS Software, 7, Lidgett Crescent, Roundhay, Leeds LS8 1HN.
dK'tronics, 23, Sussex Road, Gorleston, Great Yarmouth, Norfolk.
Bug Byte Software, 98-100 The Albany, Old Wall Street, Liverpool L3 9EP.

PROGRAM PRINTOUT

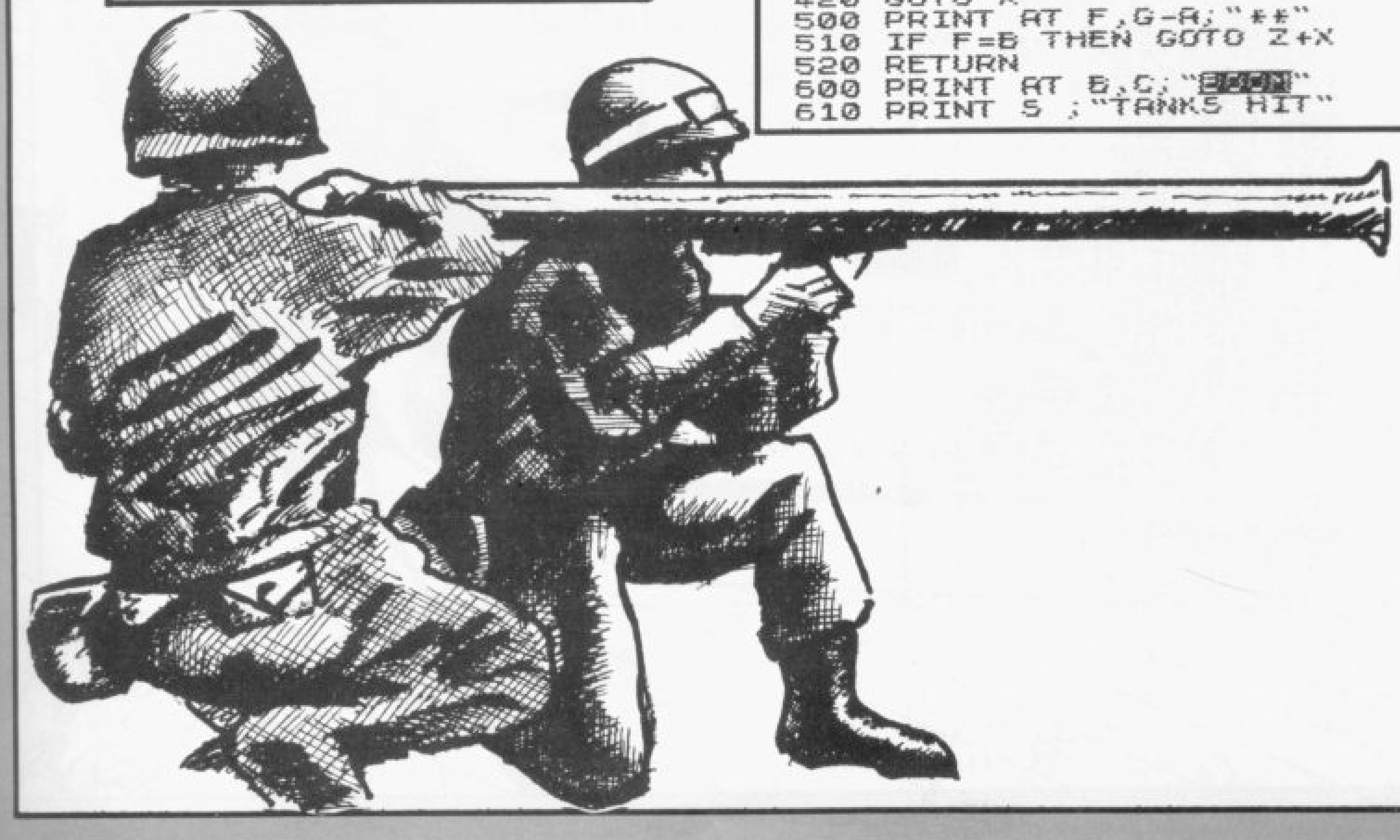
BAZOOKA

MANOEUVRE your **Bazooka** with keys 1 and Q, and fire at the oncoming tank with 0 before it can nail you with its own weapon.

A simple but effective game, submitted by A S Gale of Exeter. Perhaps its most distinctive feature is that it manages to produce both flicker-free graphics and an enemy which fights back — and that on a 1K ZX-81. Graphics notes:

- 40 — Graphic A
- 128 — Inverse minus, Inverse 0, graphic 5, space.
- 150 — Inverse shifted M
- 190 — Graphic 4, graphic 2
- 199 — Inverse space
- 200 — Space, shifted M
- 240 — Inverse shifted J
- 400 — Asterisk, O, graphic A
- 500 — Shifted H
- 600 — Inverse BOOM

```
  10 LET A=PI/PI
  20 LET C=PI-PI
  30 LET S=C
  40 LET B=CODE "▒"
  50 LET X=VAL "100"
  60 LET Y=CODE "COS "
  70 LET Z=VAL "500"
 100 CLS
 105 LET F=INT (RND*CODE "?")
 110 LET G=CODE "."
 128 PRINT AT F,G;"-0▌ "
 130 LET G=G-A
 140 IF G<=C THEN GOTO X
 150 PRINT AT B-A,C;" ";AT B+A,C
;" ";AT B,C;"█"
 155 LET D=C
 160 IF INKEY$="1" THEN LET B=B-
A
 170 IF INKEY$="Q" THEN LET B=B+
A
 180 IF INKEY$="0" THEN GOTO Y
 190 IF INT (RND*CODE "▗")=CODE
"▝" THEN GOSUB Z
 199 GOTO CODE "█"
 200 PRINT AT B,D;" >"
 210 LET D=D+A
 220 IF D<G THEN GOTO Y
 230 IF B=F AND D=G THEN GOTO Y+
Y
 240 GOTO CODE "█"
 400 PRINT AT F,G+A;"*O▒"
 405 PRINT AT F,G+A;"***"
 410 LET S=S-A
 420 GOTO X
 500 PRINT AT F,G-A;"**"
 510 IF F=B THEN GOTO Z+X
 520 RETURN
 600 PRINT AT B,C;"BOOM"
 610 PRINT S ;"TANKS HIT"
```



AIR-SEA ATTACK

```
KEYS 5 AND 8 CONTROL THE
CURSOR

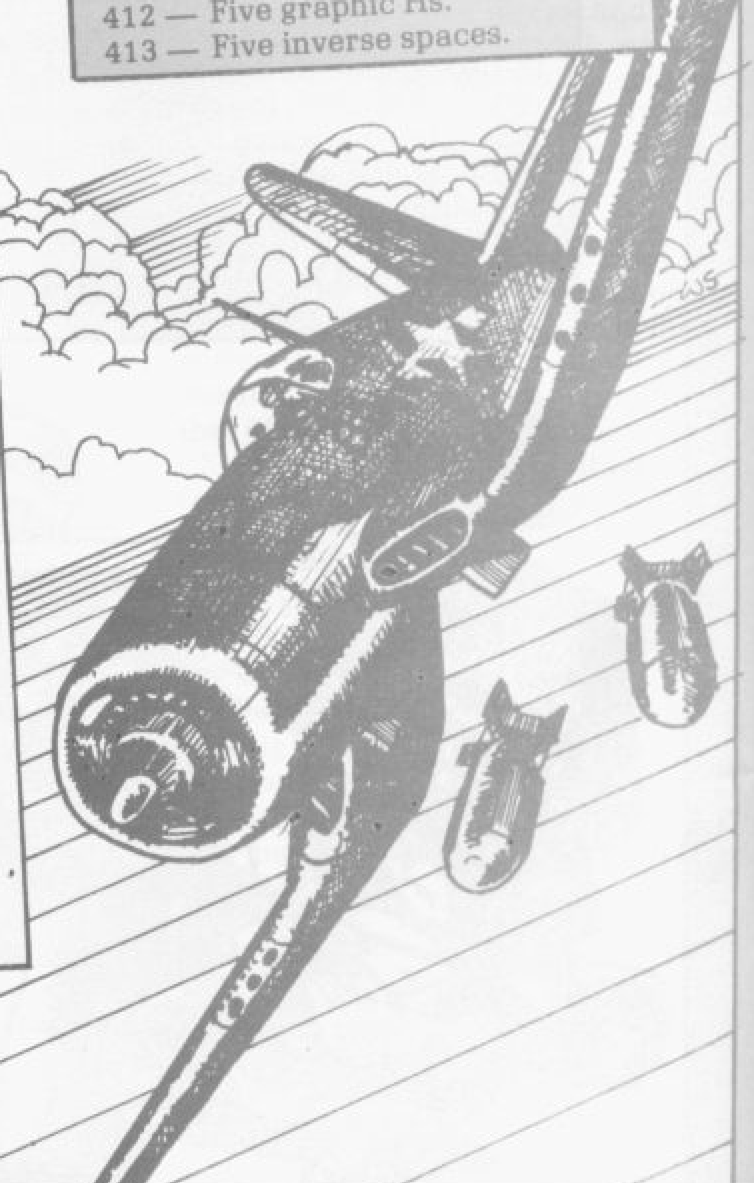
KEY 0 RELEASES THE TORPEDO


   1 REM AIR SEA ATTACK
   2 LET X=0
   3 LET X1=0
   4 LET V=10
   5 LET W=15
   8 LET HITS=156
   9 FOR N=10 TO 21
  10 PRINT AT N,0;"
"
  15 NEXT N
  16 PRINT AT 21,0;"HITS SO FAR
0"
  17 GOTO 190
  18 LET X=X+1
  19 IF M=0 THEN LET Q=X
  21 LET X=X-X*(X=30)+30*(X=-1)
  30 PRINT AT 0,X;" "
  31 IF X=29 THEN PRINT AT 0,29;
" "
  32 LET X1=X1+(INKEY$="8")-(INK
EY$="5")
  33 IF X1<0 THEN LET X1=0
  34 IF X1>28 THEN LET X1=28
  35 PRINT AT 20,X1;" C "
  36 IF V=28 THEN LET W=INT (RND
*9)+11
  40 LET V=V+1
  41 LET V=INT V-V*(V=29)+29*(V=
-V)
  42 PRINT AT W,V;"     "
  43 IF V=28 THEN PRINT AT W,28;
"    "
  44 IF INKEY$="0" THEN LET M=1
  46 IF M=1 THEN GOTO 100
  50 GOTO 18
 100 LET X0=X1-Q
 110 LET Y=21
 120 LET Z=ABS X0
 130 IF ABS Y>Z THEN LET Z=ABS Y
 140 LET F=F+1
 142 LET FR=(W=H)+(V=INT G+Q)+(V
+2=INT G+Q)+(V+3=INT G+Q)
 143 IF FR>=2 THEN GOTO 2400
 145 IF H<=9 THEN PRINT AT H.G+Q
"*"
 149 IF H>=10 THEN PRINT AT H,G+
Q;"*"
 151 IF H<=9 THEN PRINT AT H,G+Q
;" "
 152 IF H>=10 THEN PRINT AT H,G+
Q;" "
 160 LET G=G+X0/Y
 170 LET H=H+Y/Z
 185 IF F<Z-1 THEN GOTO 18
 190 LET M=0
 191 LET G=0
 192 LET H=0
 194 LET C=0
 195 LET F=0
 200 GOTO 18
 400 REM SCORE
 410 LET HITS=HITS+1
 411 FOR N=1 TO 20
 412 PRINT AT W,V;"     "
 413 PRINT AT W,V;"     "
 414 NEXT N
 420 PRINT AT 21,12;CHR$ HITS
 430 IF HITS=160 THEN GOTO 500
 437 LET FR=0
 438 LET V=0
 439 FOR N=1 TO 30
 440 NEXT N
 442 PRINT AT 0,X;"  "
 445 LET X=X+INT (RND*3)+1
 446 GOTO 190
 500 PRINT AT 21,0;"PRESS N L TO
PLAY AGAIN"
 510 INPUT A$
 515 CLS
 520 GOTO 1
```

THIS IS a distinctly topical sub-hunt game, submitted by M Thurston of Manchester, in which a torpedo is dropped from a patrolling aircraft and homes-in on the cursor C. The cursor is manoeuvred so that it draws the torpedo into the path of the submarine.

Since the movements of three separate points — submarine, aircraft and torpedo — must be correlated, a high degree of skill is involved. In addition, the depth of the submarine varies by a random value. The graphics are strong and pleasing. (16K ZX-81). Graphics notes:

- 10 — Thirty-two inverse spaces.
- 30 — Space, inverse shifted M.
- 35 — Inverse space, inverse C, inverse space.
- 42 — Inverse space, graphic G, graphic H, graphic G, inverse space.
- 43 — Four inverse spaces.
- 149 — Inverse asterisk.
- 151 — Space.
- 152 — Inverse space.
- 412 — Five graphic Hs.
- 413 — Five inverse spaces.






```
  10 LET L=CODE "."
  20 LET A=CODE "■"
  30 LET B=A
  40 LET M=A
  50 LET I=CODE "("
  60 PRINT "█████████████████";T
AB L;"█ ▒***▒***▒***▒$█"
  70 FOR G=L TO CODE "▒"
  80 PRINT "█*▒*▒*▒*▒*▒*▒*▒*█"
  90 NEXT G
 100 PRINT "█***▒***▒***▒***█";T
AB L;"██████ZX-MAN█████"
 110 FOR F=CODE "█" TO L STEP -M
 120 LET A=A+(INKEY$="6")-(INKEY
$="7")
 130 LET B=B+(INKEY$="8")-(INKEY
$="5")
 140 PRINT AT A,B;"C"
 150 IF A=M AND B=I-M THEN PRINT
 "SCORE ";F;"ZX LIVES";W
 160 PRINT AT A,B;" "
 170 IF A=L OR A=CODE ":" OR B=L
 OR B=I THEN PRINT "ZX-KILLED";W
 180 LET E=INT (RND*CODE "£")
 190 IF E=A AND B<A THEN PRINT A
T A,B;"G";TAB L;"GHOST GOTCHA";W
 200 NEXT F
 210 PRINT "TIME UP"
```

ZX-MAN is a silicon-based life form, writes its discoverer, Chris Handley. It thrives on a diet of asterisks but is killed instantly by the inverse spaces which make up its maze-like ecosphere. Your task is to use keys 6, 7 and 8 to guide the **ZX-Man** through the maze without running out of time or into walls.

An additional hazard is provided by the ghosts of previous ZX-Men which materialise unpredictably and gobble him up. Only in the home straight is he safe from this ghoulish threat.

It is an excellent 1K game for the ZX-81, though the fit is so tight that adding 's' to the word 'ghost' is sufficient to halt the program.

Graphic notes:

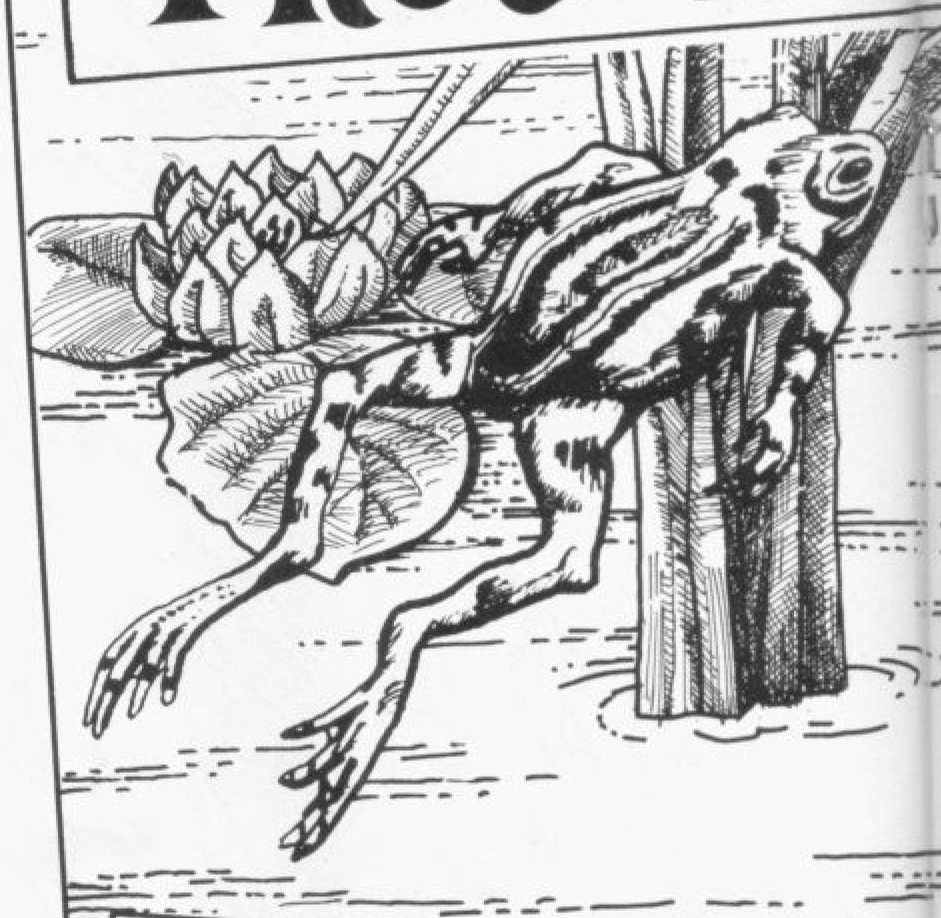
60-17 Inverse spaces.

100-6 Inverse spaces, inverse 'ZX-MAN', five, inverse spaces.

180 — Inverse £.

190 — Inverse G.

FROGGER



```
   1 REM "LEAP FROG"
   2 REM COPYRIGHT P.HAMMOND   MA
Y 1982
   3 PRINT AT 11,4;"L   E   A   P
 F   R   O   G"
   4 PAUSE 100
   5 CLS
   6 PRINT "DO YOU WANT INSTRUCT
IONS ?"
   7 INPUT P$
   8 IF P$="Y" THEN GOSUB 8999
   9 CLS
  10 LET H=0
  12 LET H=H
  14 LET F=1
  15 LET S=0
  16 LET E=20
  17 LET F=F
  18 PRINT AT 21,3;"FRAME ";F
  19 PRINT AT 21,15;"SCORE ";S
  20 LET S=S
  95 LET C=INT (RND*25)+3
 100 FOR A=0 TO 8
 105 LET E=E-2*(INKEY$="7")
 106 LET C=C-2*(INKEY$="5")+2*(I
NKEY$="8")
 107 PRINT AT E,C;"▣"
 108 IF C>28 THEN LET C=28
 109 IF C<5 THEN LET C=5
 110 GOSUB 2500
 115 GOSUB 5000
 118 IF E<=0 AND E=CODE " " THEN
 GOTO 2000
 119 IF INKEY$="7" THEN LET S=S+
10
 120 PRINT AT 21,15;"SCORE ";S
 125 IF E<14 THEN GOTO 509
 130 IF E>16 THEN GOSUB 3000
 140 IF E=16 THEN GOSUB 3120
 150 IF E=14 THEN GOSUB 4000
 400 GOSUB 4000
 510 PRINT AT 0,A;" ▌▒▒▒▐  ▌▒▒▒▐
▌▒▒▐  ▌▒▒▐ "
 511 PRINT AT 2,0;"████████████";AT 3,0;"████";A
T 12,0;"████████";AT 13,0;"████████";AT 18,0;"
██████████";H;AT 20,0
AT 19,6;"HIGH SCORE: ";H;AT 20,0
██"
 512 PRINT AT 4,A;" ▣          ▣
 ▣      ▣ "
 513 PRINT AT 6,A;" ▣     ▣     ▣
▣ "
 514 PRINT AT 8,A;"               ▣
▣    ▣    ▣ "
 515 PRINT AT 10,A;" ▣           ▣
▣         ▣ "
 519 PRINT AT 14,6;"▣   ▣   ▣   ▣
▣   ▣   ▣   ▣"
 520 PRINT AT 16,6;"▣   ▣   ▣   ▣
▣   ▣   ▣   ▣"
 530 NEXT A
 540 IF A+23>=31 THEN GOTO 550
 545 IF A+23>=0 THEN GOTO 100
 550 FOR A=8 TO 0 STEP -1
 551 PRINT AT E,C;"▣"
 552 IF C>28 THEN LET C=28
 553 IF C<5 THEN LET C=5
 555 LET E=E-2*(INKEY$="7")
 556 LET C=C-2*(INKEY$="5")+2*(I
NKEY$="8")
 558 GOSUB 2500
 566 IF E<=0 AND E=CODE " " THEN
 GOTO 2000
 567 GOSUB 5000
 568 IF INKEY$="7" THEN LET S=S+
10
 569 PRINT AT 21,15;"SCORE ";S
 570 IF E<14 THEN GOTO 1600
 575 IF E>16 THEN GOTO 1600
 580 GOSUB 3000
 590 GOSUB 4000
1600 GOTO 509
2000 PRINT AT E,C;"MISSED"
2004 PRINT AT 21,15;"SCORE ";S
2006 GOTO 9500
2500 IF E<=0 AND C=A+2 THEN GOTO
 2510
2501 IF E<=0 AND C=A+3 THEN GOTO
 2510
2502 IF E<=0 AND C=A+8 THEN GOTO
 2510
2503 IF E<=0 AND C=A+9 THEN GOTO
 2510
2504 IF E<=0 AND C=A+14 THEN GOT
O 2510
2505 IF E<=0 AND C=A+15 THEN GOT
O 2510
2506 IF E<=0 AND C=A+20 THEN GOT
O 2510
2507 IF E<=0 AND C=A+21 THEN GOT
O 2510
2508 RETURN
2510 LET F=F+1
2512 PRINT AT E,C;"▣"
2515 PRINT AT 21,15;"SCORE ";S
```



THIS VERSION of the arcade game **Frogger** was submitted by P Hammond of Ipswich. The idea is to jump the frog across a lily pond, dodge the speeding cars on a motorway, and lead it to safety in one of the moving froggy rest-homes on the other side.

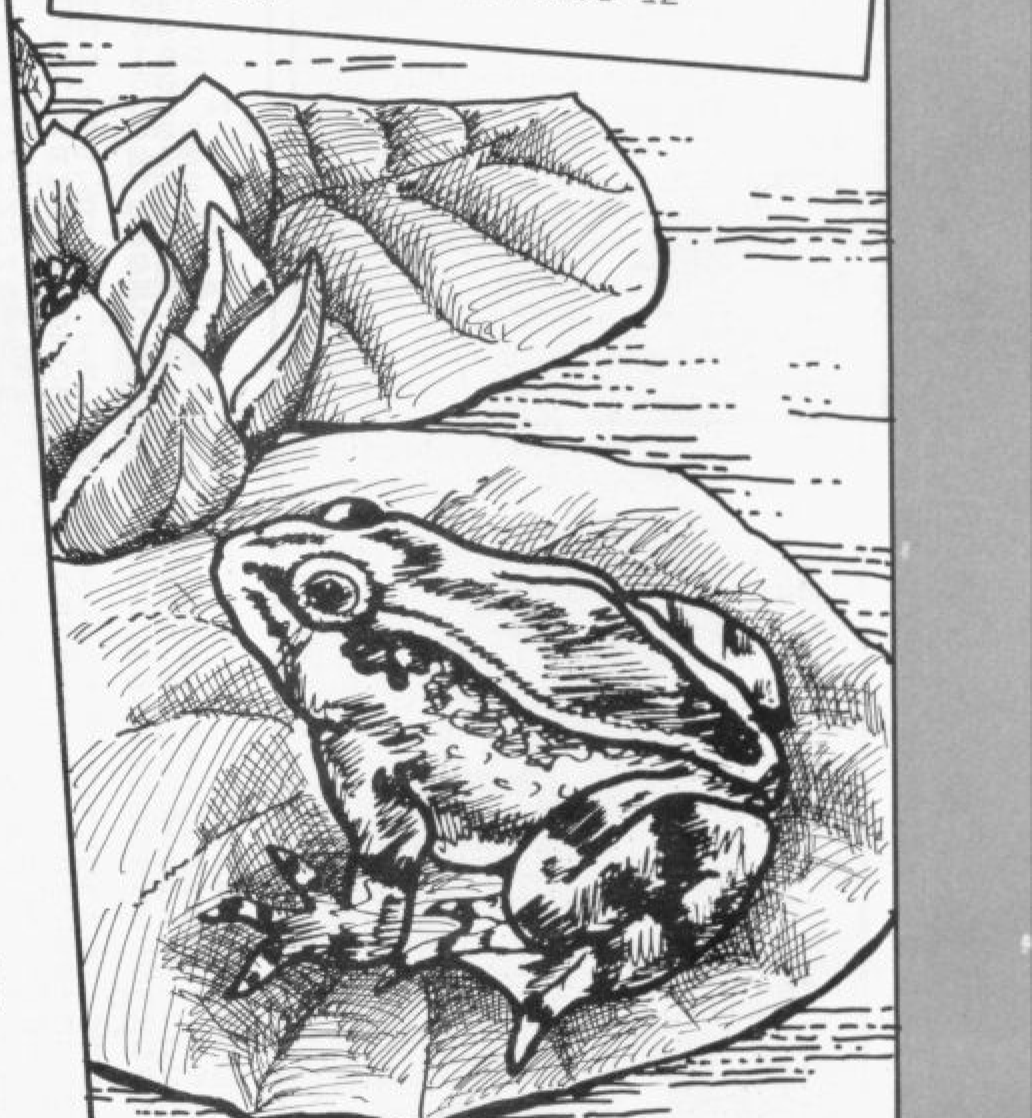
Features include a running display of scores, instructions on request and a pleasing range of wipe-out logos — pond, motorway and frog-homes give Plop, Splat and Missed respectively.

Your frog is prodded into action with keys 5, 7 and 8 and earns you a bonus for every frame it manages to heave itself across. Graphic notes:

107 — Inverse F.
510 — Graphic 5, two graphic As, graphic 8.
512 — Inverse C.
519 — Inverse L.
551 — Inverse F.
2521 — Inverse F.

```
2520 PAUSE 75
2525 LET S=S+100
2530 CLS
2535 GOTO 16
3000 IF E=16 AND C=6 THEN GOTO 5
09
3001 IF E=16 AND C=9 THEN GOTO 5
09
3002 IF E=16 AND C=12 THEN GOTO
509
3003 IF E=16 AND C=15 THEN GOTO
509
3004 IF E=16 AND C=18 THEN GOTO
509
3005 IF E=16 AND C=21 THEN GOTO
509
3006 IF E=16 AND C=24 THEN GOTO
509
3007 IF E=16 AND C=27 THEN GOTO
509
3120 IF E=14 AND C=6 THEN GOTO 5
09
3121 IF E=14 AND C=9 THEN GOTO 5
09
3122 IF E=14 AND C=12 THEN GOTO
509
3123 IF E=14 AND C=15 THEN GOTO
509
3124 IF E=14 AND C=18 THEN GOTO
509
3125 IF E=14 AND C=21 THEN GOTO
509
3126 IF E=14 AND C=24 THEN GOTO
509
3127 IF E=14 AND C=27 THEN GOTO
509
4000 PRINT AT E,C;"PLOP"
4001 PRINT AT 21,15;"SCORE ";S
4002 GOTO 9500
5000 IF E=4 AND C=A+1 THEN GOTO
5400
5010 IF E=4 AND C=A+8 THEN GOTO
5400
5020 IF E=4 AND C=A+15 THEN GOTO
5400
5030 IF E=4 AND C=A+22 THEN GOTO
5400
5040 IF E=6 AND C=A+1 THEN GOTO
5400
5050 IF E=6 AND C=A+5 THEN GOTO
5400
5060 IF E=6 AND C=A+9 THEN GOTO
5400
5070 IF E=6 AND C=A+13 THEN GOTO
5400
```

```
5080 IF E=8 AND C=A+10 THEN GOTO
 5400
5090 IF E=8 AND C=A+14 THEN GOTO
 5400
5100 IF E=8 AND C=A+18 THEN GOTO
 5400
5110 IF E=8 AND C=A+22 THEN GOTO
 5400
5120 IF E=10 AND C=A+1 THEN GOTO
 5400
5130 IF E=10 AND C=A+8 THEN GOTO
 5400
5140 IF E=10 AND C=A+15 THEN GOT
O 5400
5150 IF E=10 AND C=A+22 THEN GOT
O 5400
5300 RETURN
5400 PRINT AT E,C;"SPLAT"
5401 PRINT AT 21,15;"SCORE ";S
5402 GOTO 9500
8999 CLS
9000 PRINT AT 0,11;"LEAP FROG"
9001 PRINT AT 3,3;"YOU MUST JUMP
 YOUR FROG:""■""."
9002 PRINT AT 4,0;"OVER THE LILY
 PADS:""■""" TO THE"
9003 PRINT AT 5,0;"MOTORWAY. YOU
 HAVE TO CROSS THE"
9004 PRINT AT 6,0;"ROAD,AVOIDING
 THE CARS (WHICH"
9005 PRINT AT 7,0;"KEEP CHANGING
 DIRECTION),"
9006 PRINT AT 8,0;"TO GET THE FR
OG HOME:""▌▒▐""."
9007 PRINT AT 10,3;"ONLY FORWARD
 MOVEMENT SCORES."
9008 PRINT AT 11,0;"BUT YOU GET
A BONUS OF 100 FOR"
9009 PRINT AT 12,0;"EACH FRAME C
LEARED"
9010 PRINT AT 14,0;"MOVEMENT KEY
S ARE:""5"",""7""AND""8""."
9011 PRINT AT 16,0;"PRESS N/L WH
EN YOU""RE READY."
9012 PAUSE 4E4
9013 IF INKEY$="" THEN CLS
9014 RETURN
9500 PAUSE 200
9501 IF H<S THEN LET H=S
9510 CLS
9519 PRINT "DO YOU WANT ANOTHER
GO ?"
9520 INPUT Y$
9530 IF Y$="Y" THEN GOTO 12
9540 STOP
```

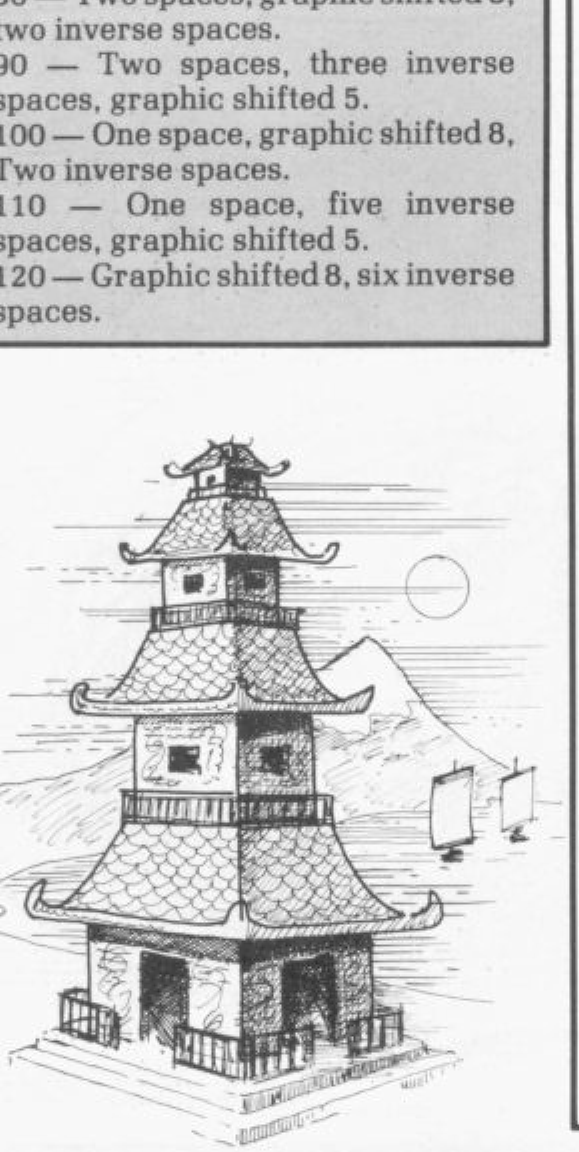


TOWERS of HANOI

THIS game is from the mysterious east via Simon Annetts of Rhayader, Powys. It is velly, velly good.

Your Sinclair will erect three pegs and on the centre peg will place six rings in order of descending size. Your task is to transfer the rings one by one until they are all assembled in the correct order on one of the other pegs.

You cannot place a bigger ring on a smaller one and the computer will chastise you if you try. An excellent little game which went immediately on to the office tape. Graphics notes:
30 — 32 graphic shifted 8s.
50 — Three spaces, graphic shifted 8, 7 spaces, graphic shifted 8, seven spaces, graphic shifted 8.
67 — Three spaces, graphic shifted 8.
70 — Three spaces, inverse space, graphic shifted 5.
80 — Two spaces, graphic shifted 8, two inverse spaces.
90 — Two spaces, three inverse spaces, graphic shifted 5.
100 — One space, graphic shifted 8, Two inverse spaces.
110 — One space, five inverse spaces, graphic shifted 5.
120 — Graphic shifted 8, six inverse spaces.

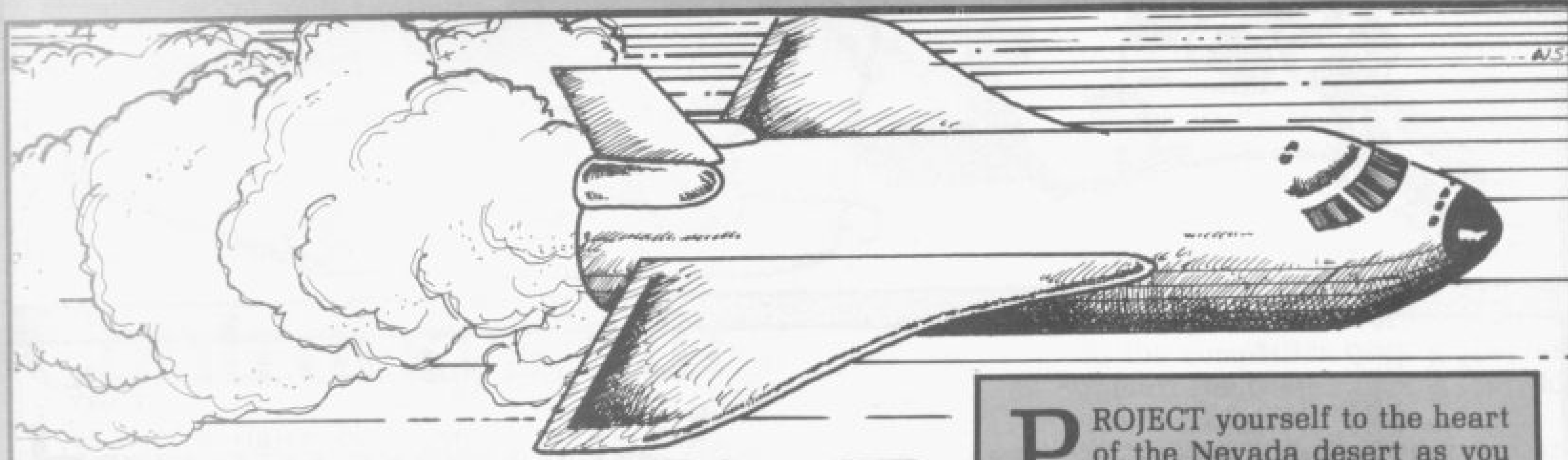


```
  10 REM "TOWERS OF HANOI"
  20 CLS
  30 PRINT AT 20,0;"████████████████████████████████"
  35 PRINT AT 21,5;"1";TAB 16;"2";TAB 24;"3"
  40 FOR X=10 TO 15
  50 PRINT AT X,5;"   █       █       █"
  60 NEXT X
  61 DIM A(3,7)
  65 DIM A$(7,8)
  67 LET A$(1)="   █"
  70 LET A$(2)="   ██"
  80 LET A$(3)="  ███"
  90 LET A$(4)="  ████"
 100 LET A$(5)=" █████"
 110 LET A$(6)=" ██████"
 120 LET A$(7)="███████"
 130 FOR Z=7 TO 1 STEP -1
 135 LET A(1,Z)=1
 140 LET A(2,Z)=Z
 145 LET A(3,Z)=1
 150 NEXT Z
 155 LET C=1
 160 FOR Z=1 TO 3
 170 FOR Y=7 TO 1 STEP -1
 180 PRINT AT Y+12,Z*8-3;A$(A(Z,Y))
 190 NEXT Y
 195 NEXT Z
 201 PRINT AT 0,24;"MOVE:";C
 205 IF A(1,2)=2 OR A(3,2)=2 THEN GOTO 2000
 208 PRINT AT 0,0;"                    "
 210 PRINT AT 0,0;"FROM ?"
 220 INPUT J
 230 PRINT AT 0,0;J;" TO ?"
 240 INPUT K
 250 PRINT AT 0,0;J;" TO ";K
 255 IF J>3 OR J<1 OR K>3 OR K<1 THEN GOTO 1000
 260 IF K=J THEN GOTO 1000
 270 FOR D=1 TO 7
 280 IF A(J,D)=1 THEN GOTO 320
 290 LET P=D
 300 LET Q=A(J,D)
 310 GOTO 340
 320 NEXT D
 330 GOTO 1000
 340 FOR D=1 TO 7
 350 IF A(K,D)=1 THEN GOTO 370
 360 IF A(K,D)<Q THEN GOTO 1000
 365 IF A(K,D)>1 THEN GOTO 380
 370 NEXT D
 380 LET D=D-1
 390 LET A(K,D)=A(J,P)
 400 LET A(J,P)=1
 410 LET C=C+1
 420 GOTO 160
1000 FOR U=0 TO 20
1010 NEXT U
1020 PRINT AT 0,0;"INVALID MOVE"
1030 FOR U=0 TO 30
1040 NEXT U
1050 GOTO 208
2000 PRINT AT 0,0;"YOU HAVE COMPLETED THE TOWERS OF HANOI IN";C-1;"MOVES"
2010 PRINT
2020 PRINT "TRY AGAIN?"
2030 INPUT S$
2040 IF S$="YES" OR S$="Y" THEN RUN
2050 STOP
```

INTEREST CALCULATION

DOES INTEREST interest you? If so, so will a program submitted by Christopher Green of Stratford-on-Avon. Enter the amount, the percentage, the length of time involved, and the settlement period — the intervals at which payments are due — and the computer will crunch until your eyes scroll.

```
   5 REM "INTEREST CALCULATION"
  10 PRINT "ENTER THE AMOUNT CON
CERNED"
  30 INPUT A
  40 PRINT "ENTER THE PERCENTAGE
 PER ANNUM"
  50 INPUT B
  60 PRINT "ENTER THE YEARS. THE
N THE MONTHS"
  70 INPUT C
  80 INPUT E
  90 LET D=C*12+E
 100 PRINT "ENTER THE SETTLEMENT
 PERIOD IN MONTHS"
 110 INPUT F
 120 LET DD=D/F
 130 FOR G=1 TO INT D
 140 LET H=INT (A*(B*F/12))/100
 150 PRINT "PERIOD ";G;":£";A;"+
";B;"0/0=£";A+H
 160 LET A=A+H
 170 IF PEEK 16442<=2 THEN SCROL
L
 180 NEXT G
 190 PRINT "PRESS ANY KEY TO CON
TINUE"
 200 IF INKEY$="" THEN GOTO 200
 210 CLS
 220 GOTO 10
```



SHUTTLE

PROJECT yourself to the heart of the Nevada desert as you steer 'the heaviest glider in the world' to a safe landing.

It is a **Land the Space Shuttle** game, submitted by G Banks, of Wakefield, West Yorkshire.

The display features the shuttle drifting down diagonally from left to right, through a number of obstacles, low-flying vultures or loosened thermal tiles, perhaps. A stab on the 7 key will boost the shuttle temporarily to a higher altitude while still keeping it on line, you hope, for the landing pad on the right of the screen.

The game is suitable for an unexpanded ZX-81, though you will find yourself running out of memory periodically and in need of the CONT button. Graphic notes:

60 — Graphic A.
80 — Three graphic Ds.
100 — Graphic W, Graphic 6, Inverse space, graphic W.
400 — Asterisk, inverse asterisk, asterisk.

```
  10 LET D=VAL "15"
  20 LET K=VAL "D<>D"
  30 LET S=VAL "K"
  40 LET F=VAL "K"
  50 FOR L=VAL "1" TO VAL "12"
  60 PRINT AT (RND*VAL "5")+VAL
"16",RND*VAL "20";"▒"
  70 NEXT L
  80 PRINT AT VAL "21",VAL "25";
"▀▀▀"
 100 PRINT AT D,F;"▄▄█▄";AT D,F+V
AL "3";
 120 GOTO 200+(200 AND (PEEK (PE
EK (16398)+256*PEEK (16399)))=8)
+(200 AND F=26)+(200 AND F<25 AN
D D=21)+(400 AND F=25 AND D=21)
 200 PRINT AT D,F;"    "
 201 LET D=D+(INKEY$<>"7")-(INKE
Y$="7")
 205 LET F=F+VAL "1"
 210 IF INKEY$="7" THEN LET S=S+
VAL "1"
 230 GOTO VAL "100"
 400 PRINT AT D,F;"*█*";E
1000 PRINT AT K,K;"YOU WIN FUEL
USED=";S
```

LIMERICK WRITER

THERE WAS A young fellow
from Lancs.,
Who sent us a program which
ranks
As the best of all time
For churning out rhyme
And it hereby is printed with
thanks.

The basics of an excellent program. Your own ingenuity — or genius — is the limit.

Submitted by Jonathan Finstein of Salford, Lancashire. (16K ZX-81)



```
   4 REM "PW"
   5 CLS
   6 LET A=0
   7 LET B=0
   8 LET A=A+1
   9 IF A=6 THEN GOTO 200
  10 LET A$="THERE WAS A YOUNG M
AN FROM "
  20 LET B$="WHO "
  30 LET C$="HIS "
  40 LET D$="ONE NIGHT AFTER DAR
K "
  50 LET E$="AND HE NEVER WORKED
 OUT "
  55 LET B=B+1
  60 LET N=INT (RND*4)+1
  70 IF A=1 THEN PRINT ;A$;
  71 IF B=1 AND N=1 THEN PRINT ;
"                              TA
SHKENT"
  72 IF B=1 AND N=2 THEN PRINT ;
"TRENT"
  73 IF B=1 AND N=3 THEN PRINT ;
"KENT "
  74 IF B=1 AND N=4 THEN PRINT ;
"GHENT"
  77 IF A=2 THEN PRINT ;B$;
  78 IF B=2 AND N=1 THEN PRINT ;
"WRAPPED UP ";
  79 IF B=2 AND N=2 THEN PRINT ;
"COVERED ";
  80 IF B=2 AND N=3 THEN PRINT ;
"PAINTED ";
  81 IF B=2 AND N=4 THEN PRINT ;
"FASTENED ";
  82 IF A=3 THEN PRINT ;C$;
  83 IF B=3 AND N=1 THEN PRINT ;
"HEAD ";
  84 IF B=3 AND N=2 THEN PRINT ;
"HAND ";
  85 IF B=3 AND N=3 THEN PRINT ;
"DOG ";
  86 IF B=3 AND N=4 THEN PRINT ;
"FOOT ";
  87 IF B=3 THEN LET B=B+1
  88 IF B=4 AND N=1 THEN PRINT ;
"IN A TENT"
  89 IF B=4 AND N=2 THEN PRINT ;
"                       WITH CEME
NT"
  90 IF B=4 AND N=4 THEN PRINT ;
"                            THAT
 WAS BENT"
 100 IF B=4 AND N=3 THEN PRINT ;
"                          WITH S
OME SCENT"
 120 IF A=4 THEN PRINT ;D$
 130 IF B=5 AND N=1 THEN PRINT ;
"IT RAN OFF ";
 131 IF B=5 AND N=2 THEN PRINT ;
"IT GLOWED ";
 132 IF B=5 AND N=3 THEN PRINT ;
"IT BLEW UP ";
 133 IF B=5 AND N=4 THEN PRINT ;
"IT TURNED BLUE ";
 140 IF B=5 THEN LET B=B+1
 141 IF B=6 AND N=1 THEN PRINT ;
"IN THE PARK"
 142 IF B=6 AND N=2 THEN PRINT ;
"LIKE A QUARK "
 146 IF B=6 AND N=3 THEN PRINT ;
"FOR A LARK"
 147 IF B=6 AND N=4 THEN PRINT ;
"WITH A BARK";
 160 IF A=5 THEN PRINT ;E$;
 170 IF B=7 AND N=1 THEN PRINT ;
"                           WHERE
 IT WENT"
 171 IF B=7 AND N=2 THEN PRINT ;
"                              IT
S INTENT"
 172 IF B=7 AND N=3 THEN PRINT ;
"                             WHY
 IT WENT"
 173 IF B=7 AND N=4 THEN PRINT ;
"                            WHAT
IT MEANT"
 190 GOTO 8
 200 PRINT
 205 PRINT "COPY?(Y OR N)"
 210 INPUT V$
 215 IF V$="Y" THEN COPY
 220 PRINT ;"DO YOU WANT ANOTHER
?(Y OR N)"
 230 INPUT Z$
 250 IF Z$="Y" THEN GOTO 6
 300 STOP
 310 SAVE "PW"
 320 RUN 5
```



Stephen Adams looks at the Data-Assette ZX-99 and finds it good but that it could involve a lot of expense.

Control system boosts power

THE ZX-99 is a control system for up to four different tape recorders which also has an RS232 tape interface for running a printer. The tape commands are all stored in a 2K ROM between 8K and 10K but the total area used is the whole of the 8K section between 8K and 16K. That is because of the way the ZX-99 divides the tape recorders — there must be at least two to make a sensible system — into INPUT and OUTPUT tape recorders. The two input sockets are selected individually and one lead is provided with the ZX-99 to connect the EAR and REMOTE sockets on the tape recorder. The normal cassette leads are plugged from the ZX-81 into the ZX-99 at the top and all of the SAVEing and LOADing is done through the ZX-99.

There is a 50-page manual with the ZX-99 and it is well worth reading before starting. It is well-written and contains not only a chapter on all of the commands but example programs, problems which may occur and any peculiarities of the system.

The commands are in the form of USR calls to various parts of the 2K ROM which can either be used direct from the keyboard or within a program. It is very easy to use in Basic but it requires the use of several variables to be set up for use by the ZX-99 before the USR commands are used.

These are a single-dimensioned string (DIMX$(300)), Z$, Z and Y. The dimensioned string can be any single letter and is used to store the data to be sent or received from the tape. Z$ is used to tell the ZX-99 which string is used for the buffer — i.e., Z$ = "X" — and variable Z the length of that buffer string to be sent. The Y variable is used to control the printing operations of the RS232 interface.

The variables can be put to other uses in the program but must be filled with the correct data for the ZX-99 before doing a USR command, or an error code will stop the program. There is also a "completion code" in the form of an error report when LET L = USR 1234 is used. Variable L can be checked if there has been a fault, as the report will be 0 if all is well.

One of the useful extras provided by the code is a check of the quality of a program which has been read back from the tape by the ZX-99. It consists of checking for three common errors — too high a level, too low a level, and varying tape speed giving longer pulses than are to be expected. A number which gives the sum of the three errors is returned in the completion code if they are found. The USR commands provide the following functions:

- Turn on the tape drive of any one input or turn on either or both of the tape drive outputs.
- Read or write a data buffer of length Z into or out of the tape recorder. On output, two copies can be made if required, one from each output.
- Skip the next block of data or program on tape.
- LOAD a program into the ZX-81 memory from an input tape drive and then SAVE it again on to one or more output tape recorders.
- Print-out a data buffer to an RS232 printer. Y defines speed, number of stop bits, parity and a choice of upper- or lower-case printing of the Sinclair character set. All codes sent to the printer

'One of the useful extras provided by the code is a check of the quality of a program which has been read back from the tape.'

continued on page 40





continued from page 39

are in ASCII and the user can define any ASCII character.

- Print a full list of a Basic program to the RS232 printer. No controls are provided — only the data and the common. Graphic characters are printed as ASCII codes.

The RS232 can be used only with a printer, as only an output on 3.5mm. jack is provided. All the ASCII control and other codes, including upper- and lower-case, can be generated from the keyboard or from within a program. When using a data buffer to print-out a string of characters, carriage return and line feed are separate but <> will produce both for a new line.

The length of the printed list is limited only by the maximum length the printer can print, so long lines will look completely different on the printer. The speed at which the printer can work can be between 110 and 9,600 baud but the RS232 port expects to print at full speed, so the printing speed must be adjusted to that with which the printer can cope.

The graphics characters in a ZX-81 program are all converted into ASCII characters and are printed as such. That means that as some of the graphics correspond to control characters it could cause some weird effects on the printer, such as double-sided characters and graphics dots. The only way to avoid that is to convert all the graphics into CHR$(×) but that wastes memory.

On the latest models, when LISTing the program, the graphics characters have been converted to spaces, enabling the user to fill-in the gaps with the appropriate graphic when the printing had been completed.

The original ZX-99s did not do that, causing problems in the LISTing. Data-Assette has offered a new ROM to people who bought the original model.

That does not apply when printing a data buffer, of course, as CR/LF can be done at any time along the entire length of the printer. One useful thing in the LIST routine is that it generates a blank line after single GOTOs, GOSUBs or RETURNs, showing the end of a routine.

> 'Non-restoration of slow mode on return to Basic is also annoying.'

The tape LOADing and SAVEing are done at the same speed and in the same way, using Sinclair ROM routines, so there is no increase in speed. The fact that five seconds of blank tape is recorded between each piece of data also means that is better only to SAVE to tape large amounts of data, otherwise the data records take so long to load.

CLS is also recommended to be used during data recording, otherwise that causes noise in the silent part of the tape. A data limit of 40 bytes is also imposed on the user as the minimum the system will put on to tape.

Block skip will check and report tape errors but will not verify the data against the program in memory. COPYing a program over-writes all the system variables, so a re-start is made after one program has been copied, thus NEWing any program in memory. BREAK is recognised throughout all the routines and will revert to a Basic listing as normal, except on COPY.

The ZX-99 has some very good features to build into programs where data needs to be written to and read from a cassette tape. Unfortunately that does not improve the speed of transfer, as the same tape system is used. The minimum requirement is two tape recorders at once, which may prove a strain on some budgets, as well as the cost of the ZX-99, which is £62.90 including VAT and postage.

The printer routines included are very useful for doing reports and graphics on a real paper printer, as the printer is under complete user control. The differences in appearance, such as the representation of lower-case by inverse letters on the screen and the limit of 32 characters per line on the ZX-81, would have to be solved by the program.

The non-restoration of slow mode on return to Basic is also annoying, as the ZX-99 works only in fast mode, for obvious timing reasons.

In all, a very good tape control and printer system. The ZX-99 can be bought by contacting Data-Assette at 44 Shroton Street, London NW1 6UG. 01-258-0409.



Little switch into reverse

THE ZX-81 video invertor consists of one integrated circuit, which is an npn transistor array, seven resistors and one coupling capacitor, all contained on one small PCB — 20mm. by 32mm. — which probably is manufactured using a Photolac process. The idea behind the device is to reverse the conventional display to give white characters on a black background, a switch being provided to return to normal display mode.

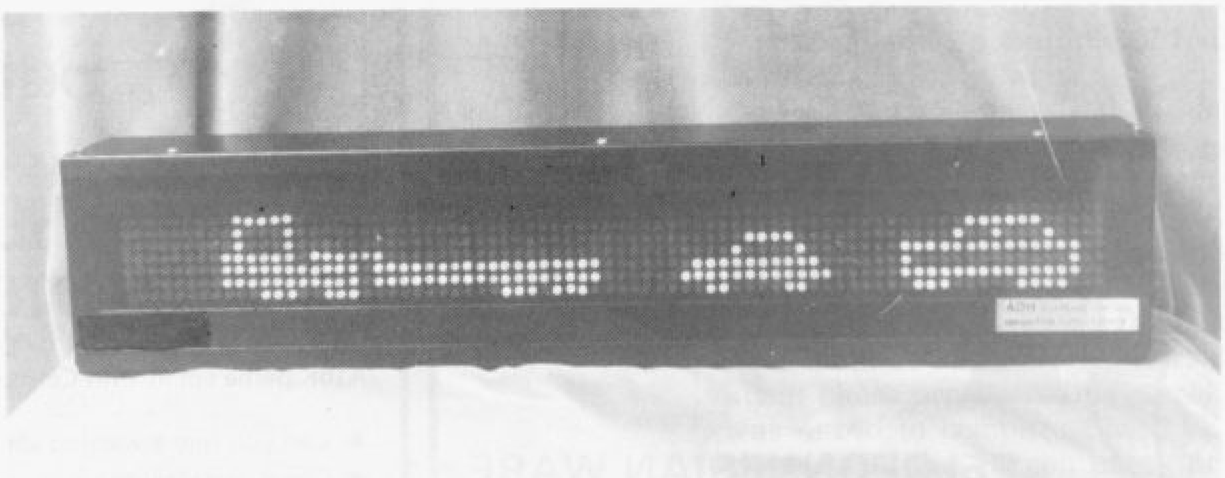
The PCB is held in place by a strip of double-sided adhesive tape on top of the logic chip IC1, although that is only for location purposes. The device works by intercepting the signal to the modulator and installation requires the cutting of a wire to the modulator and soldering four wires in appropriate positions.

The toggle switch is fitted to the rear of the ZX-81 case and a ¼in. hole has to be drilled to accommodate it. Many Sinclair users may be justifiably reluctant to drill holes in their ZX-81s so it may be possible to locate the switch in a different way, or perhaps omit it completely and stay in inverse video mode.

The invertor costs £3.50 and is available from Dieter Fritsch, G5CKZ, 6 Stanton Road, Thelwall, Warrington, Cheshire WA4 2HS.

A similar device is available from B A Reader to the one just described but consists of a single IC and a rather over-sized toggle switch, both being mounted on a small piece of Veroboard. The manufacturer has indicated that a smaller switch is now supplied with the kits. Installation again consists of drilling a hole located on top of the ZX-81 case — although space immediately below the switch is very limited — and cutting a lead to the modulator.

This inverse video switch costs £3.75 built and £2.95 as a kit and is obtainable from B A Reader, 45 Alfred St, Kings Heath, Birmingham B14 7HG.



ADH display interface

Display interface

ADH SYSTEMS has prodced an interface which allows a ZX-81 to control a LED or filament lamp display for advertising in a shop window. The system can control a 16, 24, 40 or 80-column display and is not limited only to numbers or figures. The display is seven LEDs high and can be used to display anything which fits on the column × 7 format. The displays are available as a kit — LED boards made up — or ready-made for between £62.01 and £356.50, including VAT, interface and program to run it. Contact ADH Systems Ltd, 209 Mackie Avenue, Brighton BN1 8SE. 0273-557429.

Fulcrum bleep

THE Fulcrum ZX-81 Bleep consists of a small PCB measuring 3±in. by 2in. which fits into the space inside the ZX-81 case, underneath the keyboard. That particular space is much favoured by other manufacturers for their add-ons, so it could be difficult to fit any other device there since the heat sink is close to it.

The sound, which is a short bleep, is made by a small transducer which is located in one corner of the PCB. Fulcrum emphasises that the device requires no soldering, the connections to the ZX-81 being two wires for power and a 5-way flexible cable which plugs into the existing keyboard tail socket.

The device works in both FAST and SLOW modes although it does not function on certain shifted keys.

Since the review was done the company has brought out the ZX-81 Keyboard Bleeper which covers all 210 characters.

The ZX-81 Bleep and the ZX-81 Keyboard Bleeper are both priced at £8.95, including VAT and postage, and can be obtained from Fulcrum Products.

Colourscreen for tired eyes

ELLANBEE (Graphics) can provide a cure for tired eyes from too much staring at a bright TV screen. Colourscreen is a large, coloured, optically-clear plastic sheet which goes over the TV screen. It is a 15 × 12in. sheet which is cut to fit the size of your TV screen and then fitted carefully over it.

It requires no tape or other fixing and can be removed at any time. It is in two colours, blue or green, with instructions and a specially-stiffened storage envelope, at a cost

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of £2.95. Larger sizes are available on request from Ellanbee (Graphics), 11 Lichfield Close, Great Lumley, Chester-le-Street, Co. Durham DH3 4QH. 0385-886967.

New supply of printer paper

PRINT-N-PLOT Products, which produces a display mapping book and foils, is now supplying printer paper for the Sinclair printer. Silicon Tricks is not now supplying paper, so this would seem the only alternative to Sinclair.

The quality is as good as, if not better, than that of Sinclair and at £10.95 is cheaper. Print-N-Plot is also selling a book on computer graphics at £1.50. All prices are inclusive of VAT and paper can be obtained from various ZX computer shops.

Memory chunks

EAST LONDON Robotics has produced a incremental RAM board which allows you to add up to 16K of static RAM in 2K portions to a ZX-81. The board fits inside the ZX-81 and can be used with any RAM pack available. It requires no soldering to fit the board and its instructions cover nearly every possibility.

The board uses 6616 static RAMs and can be addressed into any position in the memory map. The 8K incremental board costs £12.01 and the 16K £13.23. To that must be added the price of the RAM chips at £4.93 and 45 pence for postage if the order is less than £15. East London Robotics is at Finlandia House, 14 Darwell Close, East Ham, London E6 4BT.

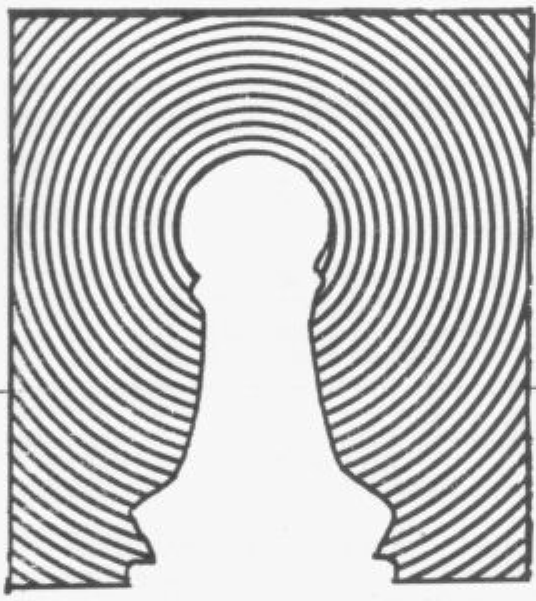
Remote controller

STRIPELAND LTD has produced a computer interface for the ZX-81 which can control another device in another room without wires between the two. The mains wiring is used to transfer a signal from the micro to the remote control unit attached to an other device.

At the moment the computer can only send signals and not receive them via the system but modifications to produce a two-way device will be available soon.

The ZX-81 computer interface costs £61.40 and the remote control £27.50, inc. VAT and postage. Stripeland is at 111 Liverpool Road, Formby, Merseyside L37 6BR. 0704-878062.

IN the June edition we published the telephone number of Eprom Services, 3 Wedgewood Drive, Leeds as 0532-667188. This should have been 0532-667183.



Philip Joy looks into his postbag and finds a wide variety of competition entries, new forms of chess and anagram games.

Good response to Nim contest

P MARSON, from Mansfield, Nottinghamshire has what look like two good programs, **HexaPawn** and **QuadraPawn.** He has included 10 pages of details about them but I have not had time to read them.

It makes a change, though, to see that amount of documentation; most people supply very few details. He asks a question about how much memory a program takes but I feel that it would be more useful for him to know how much memory is left, as he will then know how much free space he has, taking account of variables as well.

He will also know how much his program is taking up, variables and all, by taking away that figure from his memory size. I know of a USR routine in the ROM which will give the amount of free memory. The instructions look like this:

Print USRx.

What I want to know is x, its decimal value; the first person whose letter I open will be sent a copy of my adventure program. Please mark the letter USR competition.

I was delighted to receive a number of versions of both one- and three-pile **Nim**. I have decided to give copies of my adventure game to J Leaver, Bedford College, London; M Woodruff, Accrington, Lancs; H Duncan, Cambridge; J Williamson, West Lothian; I Stracey, Ely, Cambs. If they will send me a SAE with at least a C20, I will copy the adventure on to it for them.

If you send a tape to me and would like it returned, please enclose a SAE.

Some of the versions of Nim fit into 1K and one is listed, while others use machine code or show very high skill. So people have won a copy of my adventure for different reasons. The version listed is a winner, from Hugo Duncan, of Cambridge; it fits into 1K of memory.

Duncan says that the number of matches may be changed by changing line 1 and line 100. He says that if it is changed to a multiple of four, the ZX-81 is unbeatable.

Returning to chess, I thank Mr Egdoll of Glasgow for sending some more matches. I will be including those games but they take a long time to check and comment on ready for publishing.

I received a letter from the Electric Pencil Co of North Humberside about chess programs in general. I was asked to compare Chess I-ZX chess — to the Sargon chess program and Chess II to the TRS-80/VG Sargon 2.5 program. I have a Video Genie computer and a copy of the Sargon 2.5 program and I can say that if Chess II plays as well, it must be very powerful.

Two programs were received this month which are different from what has been included so far. They are **Anagram** and **Crossword** but were received too late for review this month. At first glance it looks as if they are good.

The address to send answers to problems, or about any other idea, is Philip Joy, 130 Rush Green Road, Romford, Essex, RM7 0QA.

```
1 LET X=VAL "50"
2 PRINT "NIM";TAB 1;"MAX.NO.OF MATCHES YOU MAY TAKE =3"
3 PAUSE 120
4 CLS
10 PRINT AT 0,0;"YOUR GO"
15 PRINT AT 11,5;"NO. OF MATCHES LEFT=";X;" "
20 INPUT A
25 IF A>3 OR A<1 THEN GOTO 20
30 LET X=X-A
35 PRINT AT 11,5;"NO. OF MATCHES LEFT=";X;" "
40 IF X=0 THEN PRINT AT 0,0;"YOU WIN";Q
45 PRINT AT 0,0;"  MY GO"
50 LET D=X
55 GOSUB 100
60 IF D=X THEN LET X=X-INT(RND * 3)-1
65 PAUSE 120
70 IF X=0 THEN PRINT AT 0,0;"I WIN  ";Q
75 GOTO 10
100 FOR H=0 TO 12
105 IF X-1=4*H THEN LET X=X-1
110 IF X-2=4*H THEN LET X=X-2
115 IF X-3=4*H THEN LET X=X-3
120 NEXT H
125 RETURN
```



Andrew Hewson.



File problems on display in ZX-81

YOUR LETTERS are arriving thick and fast and I am having difficulty keeping pace with them. I make a conscientious effort either to answer letters individually, via this column or by referring to other answers in the column or elsewhere.

All the questions this month concern the ZX-81 display file in one form or another. Before tackling the first, let me review some fundamental ideas. The display file is the area in RAM which holds the items which are currently displayed on the TV screen. During the program development, for example, part of the program listing is generally displayed and it is the job of the LIST routine to copy the appropriate part of the program area into the display file so that it appears on the TV screen.

The address of the beginning of the display file varies with the length of the program and so it is held in the D-FILE system variable and can be PRINTed by entering:
PRINT PEEK 16396 + 256 *
PEEK 16397

Similarly, the address of the end of the display is held in VARS — or more correctly is one less than the value in VARS — and can be PRINTed by entering:
PRINT PEEK 16400 + 256 *
PEEK 16401-1

Each line displayed on the screen is terminated by a byte containing decimal 118 and there is one more byte at the beginning of the file also containing 118. As there are 24 lines in the display, there are 25 bytes containing 118 and it is essential to the correct functioning of the display software that all 25 bytes are present. If one or more is absent the ZX-81 will almost certainly crash.

With an unexpanded ZX-81 the display file consists of those 25 bytes and no more unless a LIST, PRINT or PLOT command has been executed since the last CLS or RUN command. That is a device to keep the display file as small as possible, thereby saving valuable space in RAM. With a memory expansion pack of 4K or more the ZX-81 pads-out the display file with 32 bytes per line each containing zero — i.e., blanks. That mechanism creates an immediate problem for users without extra memory, as Michael Wordruff of Accrington has discovered. he writes: **"I am having problems with programs which POKE the display because my ZX-81 crashes every time. For instance**
5 LET Z = 1 + PEEK 16396 + 256 * POKE 16397
10 POKE Z, 128
is a disaster. What is happening?"

Wordruff's routine is attempting to POKE an inverse space into the first PRINT position and it will work well on a ZX-81 with at least 4K of RAM because the display will be padded-out with 32 blanks per line. Without the extra memory, no such padding occurs and so the routine will over-write the second of the 25 bytes containing 118, thus causing the program to crash.

The solution to the problem and to all similar ones is to create some space at the appropriate position in the display file by PRINTing one or more blank characters. In that case one space is required at the beginning of the first line and so the answer is to add the line:
2 PRINT "b"
where b represents the space character.

"I would like to give a print instruction conditional on whether or not there is anything already printed at the same position. I solved the corresponding problem by using PEEK 16438 and PEEK 16439 but the use of PEEK 16441 and PEEK 16442 does not work. Can you help?" asks Brian O'Donnell of Notting Hill, London.

Page 179 of the ZX-81 Basic Programming Manual shows that addresses 16438 and 16439 in the system variables area hold the x and y co-ordinates of the last point to be PLOTed, as O'Donnell has discovered. Unfortunately the equivalent information for PRINT is not stored. Instead the position at which the next item will be PRINTed is held in 16441 and 16442. There is a further complication; the horizontal PRINT position is counted from right

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to left and the vertical position from the bottom upwards. Thus the routine

```
10  PRINT "HELP-LINE"
20  LET A = PEEK 16441
30  LET B = PEEK 16442
40 PRINT A, B
```

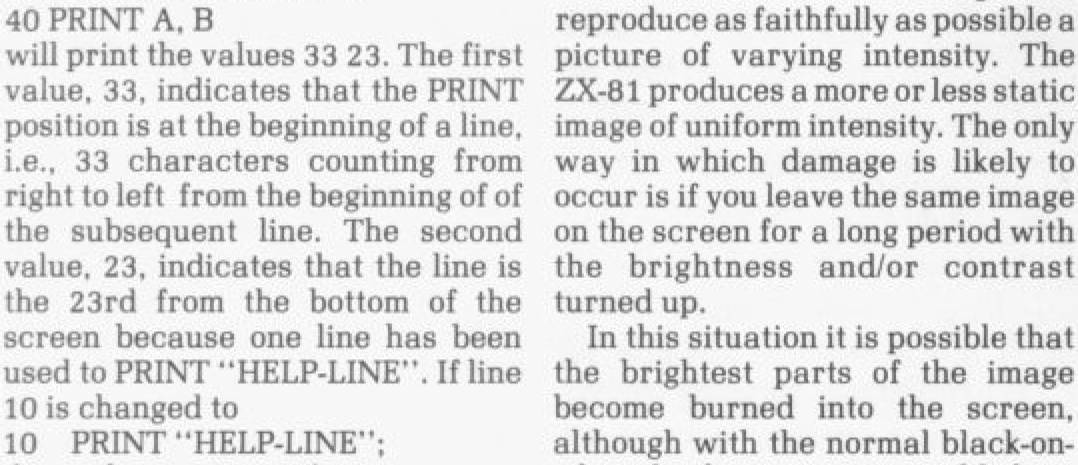
will print the values 33 23. The first value, 33, indicates that the PRINT position is at the beginning of a line, i.e., 33 characters counting from right to left from the beginning of of the subsequent line. The second value, 23, indicates that the line is the 23rd from the bottom of the screen because one line has been used to PRINT "HELP-LINE". If line 10 is changed to

```
10  PRINT "HELP-LINE";
```

the values PRINTed are 24 24, because the semi-colon prevents skipping to the next line.

The following rather artificial program PRINTs a new character over the top of the last character PRINTed:

```
10  PRINT AT 20,0; "ENTER
    VALUES FOR ""PRINT AT"""
20  INPUT A
30  INPUT B
```




```
40  PRINT AT 20,0; "ENTER A
    CHARACTER TO PRINT"
50  INPUT Z$
60  PRINT AT A,B;Z$;
70  LET B = 32 - PEEK 16441
80  LET A = 24 - PEEK 16442
90  GOTO 40
```

The semi-colon at the end of line 60 is vital. If it is omitted the information as to the position along the line cannot be recovered from 16441.

Ken Hustwitt of Royston, Hertfordshire is worried about any adverse effects his ZX-81 might have on his TV. He writes: **"I note that my TV insurance cover contains a clause excluding damage caused by the use of TV games. Can you advise if my ZX-81 can damage my set?"**

Television screens are designed to reproduce as faithfully as possible a picture of varying intensity. The ZX-81 produces a more or less static image of uniform intensity. The only way in which damage is likely to occur is if you leave the same image on the screen for a long period with the brightness and/or contrast turned up.

In this situation it is possible that the brightest parts of the image become burned into the screen, although with the normal black-on-white display your eyes are likely to feel uncomfortable long before the screen shows any ill-effects; hence while it is possible that the ZX-81 may damage the screen, damage is very unlikely if you keep the brightness and contrast at reasonable levels.

"I would like to know if all the 16K RAM packs on the market memory map the video screen", writes Neil Davies of Cannock, Staffs. The answer is yes; all 16K RAMs work in the same fashion so far as the user is concerned. The area between the D-File and VARS addresses is mapped to the TV screen.

The most interesting letter this month is from Michael Sims of Dundee. I wrote in a previous column that it is not possible to have a Basic program longer than about 15K, even if more than 16K of RAM is available, because the display file will not function correctly above address 32767 and the ZX-81 will crash. Not so, writes Sims.

"No crash occurs if the display file is entirely below 32767 or entirely above 32768 but a crash will occur if the display file straddles the two addresses and is then displayed.

"The cure is simply to ensure that when the display file nears 32767 — check the VARS system variable — you enter a huge line like:

XXXX LET ZERO = Ø + Ø + Ø + Ø + Ø + Ø + Ø + . . .

"With about 100 repetitions of + Ø. such a line takes up more memory than the display file when in the program area but lists in less. When NEWLINE is pressed display ceases while room is made below the display for the program line to be inserted, pushing the display file entirely above 32768 before display resumes."

I tried it and it worked. In case I was the only ZX-81 user who did not know the trick, I contacted Bob Branton, the software expert at Memotech Ltd, which manufactures a 64K RAM for the ZX-81. It was news to him, too, which made me feel better. In fact, Branton was so pleased with the idea that he has sent the new Memotech high-resolution graphics pack to Sims to thank him for a neat idea.

The reason Sims' "huge line" takes so much space in the program area is because each Ø is followed by six hidden bytes, the first one containing 126 and the remainder holding the numerical representation of zero. I have described the arrangement in previous columns. The six hidden bytes are omitted from program LISTings.

● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*



Disneytime cartoons come to the land of the little Sinclair

Jack Knight considers that if it were not for the moving characters, micros would lose much of their fascination

IF IT were not for the graphics I would not be as fascinated by microcomputers as I am. Moving characters and objects around the screen and making them work is challenging with only 1K of memory and without resort to the complications of machine code.

The first thing to prove is that objects can be moved any way around the screen. What is needed is something simple but realistic, something which is in its element whichever way it travels in space. An aircraft? No, speeding backwards it would hardly be credible. So a helicopter. To see what it looks like type-in the following and RUN. The loop will be needed shortly and we want its character co-ordinates to look at the graphic.

In all that follows, unless it is stated, the Vs stand for spaces.

```
10 FOR L=0 TO 26
20 PRINT AT 5,L;"---=---";TAB L;
"V■"
```

RUN. Simple, easy to play with, but with a passing resemblance to what is intended. Before you rush in with the NEXT statement, be prepared for a program short of perfection, but RUN it as it is, as there is a purpose. First:

30 NEXT L

RUN

It is a case of "tear along the dotted line". My intention was to emphasise the need for an eraser, a space or spaces to rub out the character(s) left behind as the graphic moves along. Edit line 20 by inserting a space after the first inverted commas.That is the eraser but you have not finished yet. There is a need to include another space at the beginning of the second part of the graphic, otherwise the helicopter will be lopsided. RUN.

The difficulty you have had editing a line you have only just typed-in will be worthwhile as a reminder for the future of how essential the eraser is.

Another thing to remember from the program is the TAB statement. It caused the body of the helicopter to be printed on the next line. The rule is that PRINT stays on the same line unless that would involve backspacing, when it moves to the next line.

So what about bringing the helicopter back across the screen? Delete line 10 and replace it by:

10 FOR L = 26 TO 0 STEP -1

The eraser? With line 20 a space is needed at the end of each of the two parts of the graphic. RUN.

To make the aircraft move up the screen, first replace line 10 by:

10 FOR L = 19 TO 0 STEP -1

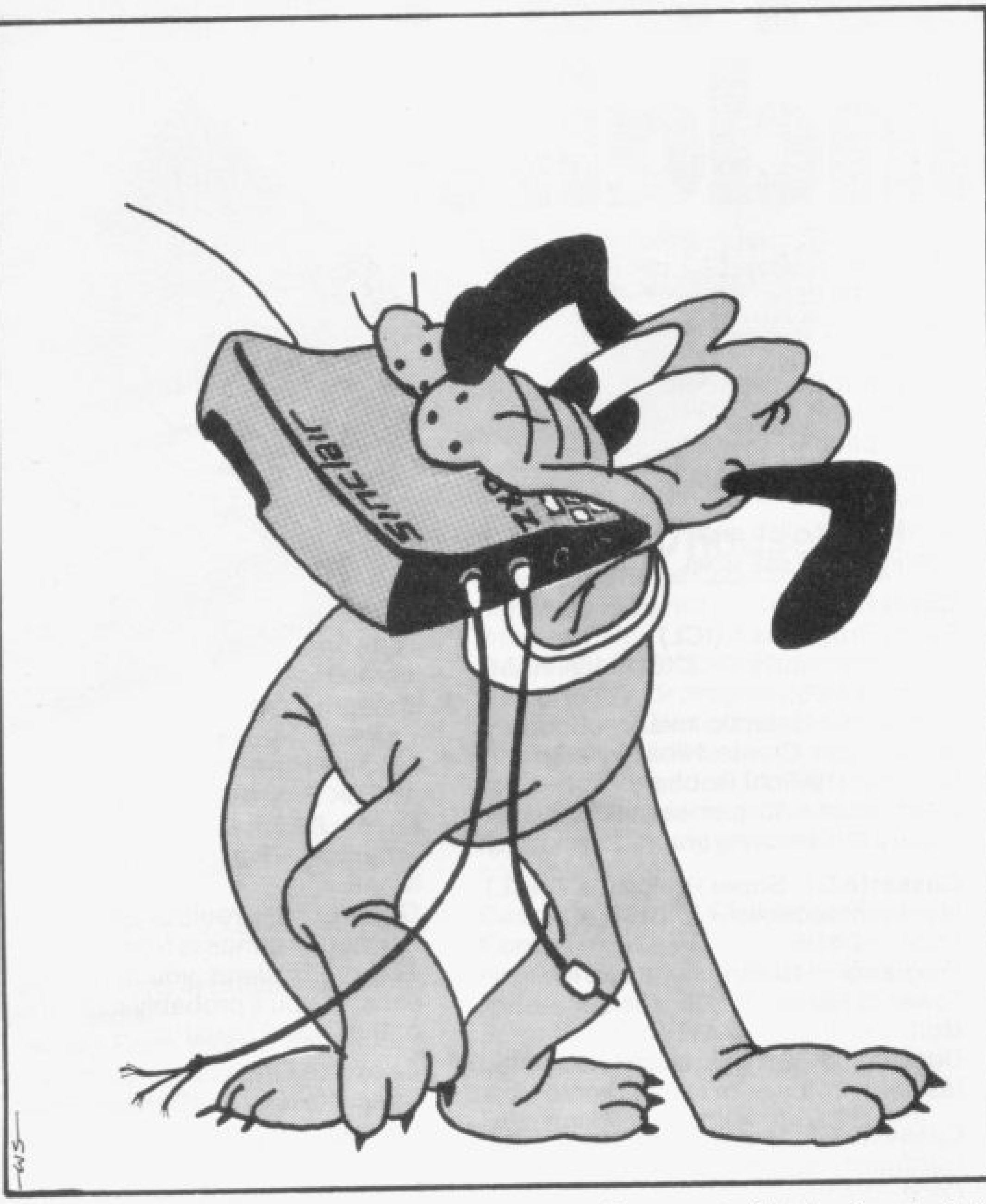
Then change line 20 to:

```
20 PRINT AT L,13;"---=---";TAB 1
3;"V■V";TAB 13;"(5 SPACES)"
```

RUN

That is the least successful





direction to move a graphic, for technical reasons. Before leaving this program, notice the string of erasers inserted to clean-up after the graphic.

To complete movement in the four main directions, the helicopter needs to be brought down the screen. Replace lines 10 and 20 by:

```
10 FOR L=0 TO 19
20 PRINT AT L,13;"(5 SPACES)";
TAB 13;"--=--";TAB 13;"V▄▀"
```

RUN

It has probably already occurred to some that it should be possible to fly the machine around the back of the screen. So add:

```
40 CLS
50 FOR L=1 TO 50
60 NEXT L
70 RUN
```

RUN

The PAUSE statement could have been used instead of lines 50 and 60 but an empty loop has the advantage that it is free of the irritating flash. The count from 1 to 50 is approximately one second — the same number of screens per second on British TV.

We have not finished yet. It is also possible to move an image diagonally up or down the screen in either direction. Staying with our patient helicopter, we will try one of the more difficult — that is from the top right corner to the bottom left; it is difficult because character co-ordinates must be used with the one increasing and the other decreasing. Type-in:

```
20 PRINT AT L,19-L;"(6 SPACES)
";TAB 19-L;"--=--";TAB 19-L;"V▄
▀"
```

RUN

Notice that once you know how, it is easy to handle increasing and decreasing numbers at the same time (L and 19-L).

Before we leave the helicopter let it show us its profile, hovering, rotars turning. Alter the last part of the graphics of line 20 and type-in new lines as follows:-

```
20 PRINT AT L,19-L;"       ";TA
B 19-L;"--=--";TAB 19-L;"=(█"
30 FOR M=1 TO 100
40 PRINT AT 1,19;"--";TAB 22;"
VV"
50 PRINT AT 1,19;"VV";TAB 22;"
--"
60 NEXT M
```

RUN

Finally, having experimented to lay the groundwork, that is the moment to run an animated cartoon, but do not expect a full-length feature — remember it is only a 1K RAM. Perhaps, however, it will set you on the way to designing your own graphics.

Before you RUN the cartoon, here are some hints, as you will be hard up against the limit of the memory. Operate NEW before you start, to clear everything first. If you need to EDIT and the ZX will not bring down the line, CLEAR and then operate EDIT immediately. If the graphics do not look correct, go over the variables, check the number of spaces and the characters to shake out the bugs.

```
 10 PRINT AT 5,5;"BOOMERANG"
 20 PAUSE 75
 30 LET A$="VVVV▄▄▄▄▄▄▄▄▄"
 40 FOR L=0 TO 10
 50 PRINT AT 15,L;A$;TAB L;"VV▄
█████";TAB L;"V▀▒▒▒▒▒▒▒▀"
 60 NEXT L
 70 PAUSE 50
 80 FOR L=20 TO 30
 90 PRINT AT 15,L;"V▄"
100 NEXT L
110 PRINT AT 15,31;"V"
120 FOR L=1 TO 18
130 PRINT AT 16,L;"V▄"
140 NEXT L
150 PRINT AT 16,19;"V"
160 PAUSE 50
170 PRINT AT 15,14;"(6 SPACES)"
;TAB 10;A$
180 PAUSE 50
190 PRINT AT 16,19;"V";TAB 19;"
▌"
200 PAUSE 100
210 PRINT AT 10,12;"THE END"
```

New ZX81 Software from Sinclair.



A whole new range of software for the Sinclair ZX81 Personal Computer is now available – direct from Sinclair. Produced by ICL and Psion, these really excellent cassettes cover games, education, and business/household management.

Some of the more elaborate programs can only be run on a ZX81 augmented by the ZX 16K RAM pack. (The description of each cassette makes it clear what hardware is required.) The RAM pack provides 16-times more memory in one complete module, and simply plugs into the rear of a ZX81. And the price has just been dramatically reduced to only £29.95.

The Sinclair ZX Printer offer full alphanumerics and highly-sophisticated graphics. A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. So now you can print out your results for a permanent record. The ZX Printer plugs into the rear of your ZX81, and you can connect a RAM pack as well.

Games

Cassette G1: Super Programs 1 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Invasion from Jupiter. Skittles. Magic Square. Doodle. Kim. Liquid Capacity.
Description – Five games programs plus easy conversion between pints/gallons and litres.

Cassette G2: Super Programs 2 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Rings around Saturn. Secret Code. Mindboggling. Silhouette. Memory Test. Metric conversion.
Description – Five games plus easy conversion between inches/feet/yards and centimetres/metres.

Cassette G3: Super Programs 3 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Train Race. Challenge. Secret Message. Mind that Meteor. Character Doodle. Currency Conversion.
Description – Fives games plus currency conversion at will – for example, dollars to pounds.

Cassette G4: Super Programs 4 (ICL)
Hardware required – ZX81.
Price – £4.95.
Programs – Down Under. Submarines. Doodling with Graphics. The Invisible Invader. Reaction. Petrol.
Description – Five games plus easy conversion between miles per gallon and European fuel consumption figures.

Cassette G5: Super Programs 5 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Martian Knock Out. Graffiti. Find the Mate. Labyrinth. Drop a Brick. Continental.
Description – Five games plus easy conversion between English and continental dress sizes.

Cassette G6: Super Programs 6 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Galactic Invasion, Journey into Danger. Create. Nine Hole Golf. Solitaire. Daylight Robbery.
Description – Six games making full use of the ZX81's moving graphics capability.

Cassette G7: Super Programs 7 (ICL)
Hardware required – ZX81.
Price: – £4.95.
Programs – Racetrack. Chase. NIM. Tower of Hanoi. Docking the Spaceship. Golf.
Description – Six games including the fascinating Tower of Hanoi problem.

Cassette G8: Super Programs 8 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £4.95.
Programs – Star Trail (plus blank tape on side 2).
Description – Can you, as Captain Church of the UK spaceship Endeavour, rid the galaxy of the Klingon menace?

Cassette G9: Biorhythms (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – What are Biorhythms? Your Biohythms.
Description – When will you be at your peak (and trough) physically, emotionally, and intellectually?

Cassette G10: Backgammon (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Programs – Backgammon. Dice.
Description – A great program, using fast and efficient machine code, with graphics board, rolling dice, and doubling dice. The dice program can be used for any dice game.

Cassette G11: Chess (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Chess, Chess Clock.
Description – Fast, efficient machine code, a graphic display of the board and pieces, plus six levels of ability, combine to make this one of the best chess programs available. The Chess Clock program can be used at any time.

Cassette G12: Fantasy Games (Psion)
Hardware required – ZX81 (or ZX80 with 8K BASIC ROM) + 16K RAM.
Price – £4.75.
Programs – Perilous Swamp. Sorcerer's Island.
Description – Perilous Swamp: rescue a beautiful princess from the evil wizard. Sorcerer's Island: you're marooned. To escape, you'll probably need the help of the Grand Sorcerer.

Cassette G13: Space Raiders and Bomber (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £3.95.
Programs – Space Raiders. Bomber.
Description – Space Raiders is the ZX81 version of the popular pub game. Bomber: destroy a city before you hit a sky-scraper.

Cassette G14: Flight Simulation (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £5.95.
Program – Flight Simulation (plus blank tape on side 2).
Description – Simulates a highly manoeuvrable light aircraft with full controls, instrumentation, a view through the cockpit window, and navigational aids. Happy landings!

Education

Cassette E1: Fun to Learn series – English Literature 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Novelists. Authors.
Description – Who wrote 'Robinson Crusoe'? Which novelist do you associate with Father Brown?

Cassette E2: Fun to Learn series – English Literature 2 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Poets, Playwrights. Modern Authors.
Description – Who wrote 'Song of the Shirt'? Which playwright also played cricket for England?



Cassette E3: Fun to Learn series – Geography 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Towns in England and Wales. Countries and Capitals of Europe.
Description – The computer shows you a map and a list of towns. You locate the towns correctly. Or the computer challenges you to name a pinpointed location.

Cassette E4: Fun to Learn series – History 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Events in British History. British Monarchs.
Description – From 1066 to 1981, find out when important events occurred. Recognise monarchs in an identity parade.

Cassette E5: Fun to Learn series – Mathematics 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Addition/Subtraction. Multiplication/Division.
Description – Questions and answers on basic mathematics at different levels of difficulty.

Cassette E6: Fun to Learn series – Music 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Composers. Musicians.
Description – Which instrument does James Galway play? Who composed 'Peter Grimes'?

Cassette E7: Fun to Learn series – Inventions 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Inventions before 1850. Inventions since 1850.
Description – Who invented television? What was the 'dangerous Lucifer'?

Cassette E8: Fun to Learn series – Spelling 1 (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £6.95.
Programs – Series A1-A15. Series B1-B15.
Description – Listen to the word spoken on your tape recorder, then spell it out on your ZX81. 300 words in total suitable for 6-11 year olds.

Business/household

Cassette B1: The Collector's Pack (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Collector's Pack, plus blank tape or side 2 for program/data storage.
Description – This comprehensive program should allow collectors (of stamps, coins etc.) to hold up to 400 records of up to 6 different items on one cassette. Keep your records up to date and sorted into order.

Cassette B2: The Club Record Controller (ICL)
Hardware required – ZX81 + 16K RAM.
Price – £9.95.
Program – Club Record Controller plus blank tape on side 2 for program/data storage.
Description – Enables clubs to hold records of up to 100 members on one cassette. Allows for names, addresses, 'phone numbers plus five lots of additional information – eg type of membership.

Cassette B3: VU-CALC (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Program – VU-CALC.
Description – Turns your ZX81 into an immensely powerful analysis chart. VU-CALC constructs, generates and calculates large tables for applications such as financial analysis, budget sheets, and projections. Complete with full instructions.

Cassette B4: VU-FILE (Psion)
Hardware required – ZX81 + 16K RAM.
Price – £7.95.
Programs – VU-FILE. Examples.
Description – A general-purpose information storage and retrieval program with emphasis on user-friendliness and visual display. Use it to catalogue your collection, maintain records or club memberships, keep track of your accounts, or as a telephone directory.

How to order

Simply use the FREEPOST order form below and either enclose a cheque or give us your credit card number. Credit card holders can order by phone – simply call Camberley (0276) 66104 or 21282 during office hours. Either way, please allow up to 28 days for delivery, and there's a 14-day money-back option, of course.

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Tel: Camberley (0276) 66104 & 21282.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR.
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	G2: Super Programs 2	31	£4.95	
	G3: Super Programs 3	32	£4.95	
	G4: Super Programs 4	33	£4.95	
	G5: Super Programs 5	34	£4.95	
	G6: Super Programs 6	35	£4.95	
	G7: Super Programs 7	36	£4.95	
	G8: Super Programs 8	37	£4.95	
	G9: Biorhythms	38	£6.95	
	G10: Backgammon	39	£5.95	
	G11: Chess	40	£6.95	
	G12: Fantasy Games	41	£4.75	
	G13: Space Raiders & Bomber	42	£3.95	
	G14: Flight Simulation	43	£5.95	
	E1: English Literature 1	44	£6.95	

Qty	Cassette	Code	Item price	Total
	E2: English Literature 2	45	£6.95	
	E3: Geography 1	46	£6.95	
	E4: History 1	47	£6.95	
	E5: Mathematics 1	48	£6.95	
	E6: Music 1	49	£6.95	
	E7: Inventions 1	50	£6.95	
	E8: Spelling 1	51	£6.95	
	B1: Collector's Pack	52	£9.95	
	B2: Club Record Controller	53	£9.95	
	B3: VU-CALC	54	£7.95	
	B4: VU-FILE	55	£7.95	
	ZX 16K RAM pack	18	£29.95	
	ZX Printer	27	£59.95	
	Post & packing – *only if ordering hardware*		£2.95	

TOTAL £ ____

I enclose a cheque/postal order to Sinclair Research Ltd for £ ____

Please charge my *Access/Barclaycard/Trustcard no.
**Please delete as applicable.*

Mr/Mrs/Miss

Address

NSA 13



Claudia Cooke talks to Rick Dickinson, Sinclair industrial designer, who won a Design Council award for the ZX-81.

Modest award-winner sets the pace in micro design

AWARD-WINNING industrial designer Rick Dickinson is modest about his achievements, which so far include the ZX-81, for which he won a Design Council award, and the Spectrum.

"I don't think I have ever been delighted with anything I have done", says this blond, 26-year-old prodigy. "There always seems to be room for improvement".

Dickinson is a meticulous worker and while both the ZX-81 and the Spectrum are selling beyond all expectations, he adds: "I would never let anything go to production unless I was happy with it".

Graduating from the Newcastle Polytechnic pioneering industrial design course, Dickinson and his classmates are equipped, theoretically, to design anything "from knives and forks to ocean tankers".

Dickinson produced items as diverse as a chain saw and a road tanker during his first year as a qualified industrial designer, which he spent freelancing in Wales.

He had already spent some time working for Clive Sinclair while he was studying for his degree and it was not long before he was absorbed as a full-time member of staff and the company's sole industrial designer. He is responsible for the appearance of Sinclair products down to the layout of the components inside and the pattern of information on the keyboards. His membrane keyboard for the ZX-81 was revolutionary and largely responsible for the low retail price of the product.

Dickinson has learned that price is the ultimate justification and on all his designs he has to bear in mind the cost factor as well as the straightforward appearance of any item.

The membrane keyboard was a

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great success and Sinclair has had to cope with numerous pirate copies since its inception but, as with everything, it had its disadvantages. Its main disadvantage was its inability to register touch. To ensure you have a response it is necessary to look at the screen — there is no reassuring click when you touch each key.

For the Spectrum, Dickinson has returned to a raised keyboard but again he has produced a first by making it from rubber.

He says: "I like the Spectrum much more than the ZX-81. It was much quicker to design but much more complicated. It is a step upmarket and I was really trying hard for a super-smart machine. It is not for quite the same amateur market".



Rick Dickinson at work in his workshop.

The process of design is a long one. Normally it begins when Clive Sinclair outlines his idea to Dickinson, including his demands about size. "He will resolve in his own mind the specifications and he will always say how small it has to be. I think how can it be that small? Yet he is always right in the end and we produce something which seemed impossible to me in the beginning".

Armed with his brief, Dickinson then spends a few days with his sketchbook, exploring ideas, but he likes to begin work in three dimensions as quickly as possible and is soon modelling in Perspex or plasticine.

The next stage is to produce the finished model in Perspex but obviously it has no components inside — it is produced as a solid block.

That model is detailed, even down to the graphics which Dickinson has painted on. Layout of the interior follows, with the designer using all his powers of logic to ensure that each component is in the best possible place. Perhaps the most difficult part is the keyboard. Dickinson says: "We spent a great deal of time on that. It is the only interface between the user and the product and it has to be right. We were trying also to cram on more information than anyone had every done. I believe that form should follow function".

Design of the ZX-81 took about six months in all. The Spectrum was quicker but with all his major projects Dickinson also has to set aside time for add-ons to existing computers — the work is never finished. His main project now is the flat-tube TV, expected to be launched later this year.

His biggest problem with that is that Sinclair has already been working on it for some time. Normally he is briefed at the same time as the electronic engineers but this time the inside is already finished. It is also another first, which means Dickinson cannot research by looking at existing products in the field.

'That is the exciting thing in this company; many products are the first of their type so you are in on something new.'

"That is the most exciting thing with this company, you know; many products are the first of their type, so you are really in on something new".

Dickinson is content with his life at the moment in every way. At school he liked the sciences and the arts and his job ensures that he remains involved in both. He spent one year on a foundation course at art college at Grimsby before starting to read for his degree and feels the experience was invaluable. He is happy with his work at Sinclair. When he started almost three years ago the staff numbered five. Today it is 30 and the company is going from strength to strength, crushing the effects of the recession as it marches on.

"We all work very closely, very much as a team. Most of the information is in people's heads. There is no time to be formal and put it down on paper. It is a good atmosphere in which to work".

For this award-winning Yorkshireman, it abounds with opportunity, too. He has already entered the Spectrum for this year's Design Council awards and on his drawing board are the initial stages of the flat-tube TV — another first, and possibly another award.

ZX81 M.C. 16K SOFTWARE

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ZX81 RENUMBER-DELETE

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ZX81 — TOOLKIT

Along with RENUMBER/DELETE, a further 3 utilities are included to make this a must for serious programmers. (1) FIRST REM EXPANDER. Expand the first REM by any specified length. Easy to use. Type 1 REM followed by any CHARACTER. Call the EXPANDER. SPECIFY the number of BYTES to add. A few BLINKS later and it's DONE. (2) DECIMAL REM LOADER. Use this to load DECIMAL CODE into the first REM. ALLOWS use of the existing line edit facilities. So easy to use. (3) 66 BYTE MEMORY LISTER. Start where you like. Specify the start address and immediately the contents and locations of 66 bytes will be DISPLAYED or PRINTED. One SINGLE KEYSTROKE will then page FORWARDS or BACKWARDS as you wish. Well written in M/code USEFUL AND FAST TOO!! £8.00 inclusive. If you're not convinced send £1.00 and we'll send the instructions. If you buy within 14 days you can deduct the £1.00.

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ZX81 HEWSON CONSULTANTS ZX81

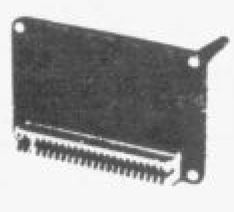
HINTS AND TIPS FOR THE ZX81 by Andrew Hewson £3.95

The most complete book at the price

"Good value and quite fascinating ... a very inexpensive way of acquiring months of programming experience" Your Computer Nov 1981

80 pages explaining how to squeeze a computing quart out of a Sinclair pint pot. Saving Space – vital reading for all ZX81 users. Understanding the Display File – using the display file as memory, clearing a part of the display, using tokens in PRINT statements. Converting ZX80 programs – explaining simply but comprehensively how to convert the hundreds of published ZX80 programs. Chaining programs – revealing techniques for passing data between programs, calling subroutines from cassette and establishing data files. Machine Code Programs – all you want to know about ZX80 machine language. Explaining how to write, load, edit and save machine code and how to debug your routines. Routines and programs are scattered liberally throughout the text and the final chapter consists of 12 useful, interesting entertaining programs such as LINE RENUMBER BOUNCER SHOOT STATISTICS etc

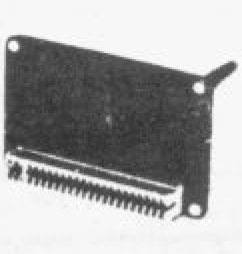
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PROGRAMMERS TOOLKIT £6.50

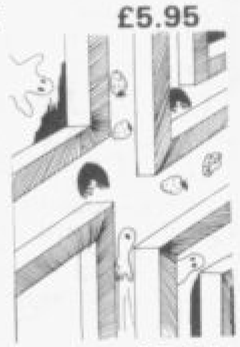
The Programmer's Friend and Slave! Are you writing your own programs for the ZX81? How can you do that without our Toolkit? It will encourage you to go on to write bigger, better and more sophisticated programs by doing your donkey work.

Simply create 3K of space above Ram top and then load the Toolkit in the normal way. The Toolkit hides above the Ram top awaiting your command. You can now load existing programs from cassette for the Toolkit to operate on. Or type in a whole new program.

Toolkit functions include

* RENUMBER including the destination lines of GOTO's and GOSUB's. START and Finish lines and Step size specified by you
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ECM 8

Pretend to be Ian Botham: win a printer



This month we are awarding the last of our five Sinclair printers in our monthly competition, for which we expect the response to be as good as for the first four.

To continue the emphasis of our Bumper Summer Special, we would like you to write a program to simulate the game of cricket. There is no limit to the size of memory which can be used but we must insist that entries are on cassette, accompanied by a typed or beautifully hand-written listing.

The judges will be looking for a program which attempts to include as many of the complexities of the game as possible. The Owzat form of the game will not be sufficient.

As a tie-break, should one be necessary, we want you to write a slogan beginning with the words: "I read *Sinclair User* because. . . . ."

Entries must reach us by August 16.

The usual rules about the editor's decision being final and employees of ECC Publications being ineligible apply.

ENTRY FORM

Complete this slogan, which will be used as a tie-break: I read Sinclair User because . . . .

Name . . . .

Address . . . .

. . . .

Send your entries to ECC Publications, 30-31 Islington Green, London N1 8BJ to arrive not later than August 16.

Membership fee can be recovered

Prices cut by Thurnall

FOLLOWING the good response to our Sinclair User Club, we have decided to make an extra special series of offers to our growing membership this month.

Two offers will be available exclusively to club members. If advantage is taken of both, they will cover the cost of membership many times over.

We are able to allow members the opportunity to buy a series of software items and hardware add-ons at discount prices.

Members will be able to obtain a 20 percent discount off all the J K Greye range of software. J K Greye produces some of the best software on the market. Following its remarkable 3D Monster Maze, recently it has introduced 3D Defender, which our reviewer this month considers to be another success.

Those and the rest of the J K Greye range are now available at a discount of 20 percent.

The offer is available only through the Sinclair User Club and cannot be obtained in any of the retail outlets which stock the J K Greye range.

STAR BARGAIN

Our other offer features Thurnall Electronics, which produces a number of hardware add-ons for the ZX-81. Among the products available from Thurnall are input/output ports, motherboards and joysticks.

All these Thurnall goods we can offer to members at a discount of 10 percent.

The discounts from J K Greye and Thurnall Electronics are open until the end of August. To allow new members to take advantage of these very generous offers you can include an order with your membership application. A form is printed below.

J K Greye Software	List price	Club price
Gamestape	£3.95	£3.15
Gamestape 2	£3.95	£3.15
Catacombs	£4.95	£3.95
3D Monster Maze	£4.95	£3.95
3D Defender	£4.95	£3.95
Breakout	£1.95	£1.55

Thurnall Electronics	List price	Club price
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assembled	£17.95	£16.55
Four-channel relay box	£14.95	£13.45
Eight-way transistor driver	£9.95	£8.95
Eight-way indicator unit	£12.95	£11.65
Joystick	£12.95	£11.65
Motherboard	£15.95	£14.35
Power supply	£4.95	£4.45

Full details of all these items can be found in advertisements in *Sinclair User*.

Facilities to include Spectrum

THE USER CLUB is to expand its facilities to cater for the growing number of Spectrum owners. For the same annual subscription of £12 they will be able to take advantage of the extra benefits which have been available to other ZX owners for the last two months.

The benefits include the bi-monthly, cassette-based newsletter which is being re-recorded so that it can be used with the Spectrum and will contain Spectrum programs.

To ensure that each member receives the correct cassette, please denote which machine you own by ticking the box on the application form below.

Meet the first member of our club on p.62

MEMBERSHIP FORM

I wish to join the Sinclair User Club and enclose my subscription of £12

Name ....

Address ....

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Which computer do you own?

ZX-81 ☐ Spectrum ☐

Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ. Cheques should be made payable to Sinclair User Club.

Sinclair helps in work, rest and play



THE FIRST member of our Sinclair User Club is an enthusiastic Sinclair supporter. He was one of the first to obtain a ZX-81, he took a year's subscription for *Sinclair User* as soon as it was announced and he placed his order for the Spectrum some time ago.

"When Sinclair brought out the ZX-80 I decided to wait, but when the ZX-81 arrived I put in an order straight away, "Peter Lown, 62, of Strathmore Avenue, Hull, North Humberside, said. He bought it with the 16K RAM pack and the printer.

A telecommunications manager with a large international company, Lown has made full use of his system both for work and in his hobby of motor sport.

"I use it to run telephone traffic analysis. It is not complicated, just number-crunching, but there is a good deal of work involved and it saves me plenty of time", he said.

Recently he has developed a program to display details and results of motor rallies. A friend has built him a regulator for converting 12V supply to the 9V needed for the Sinclair to be used away from a mains supply.

It had its first showing towards the end of June in the Cossack Rally in North Humberside. At the start it listed details of the competitors, scrolling them up so that all of them could be included. At the end it provided the results.

"It took about 25 minutes to input all the figures but we were able to do it as the cars arrived so the results were ready within two minutes of the last competitor finishing, which was the time needed to sort through all the information," Lown said.

He first had contact with computers 25 years ago and was a founder member of the Hull and District branch of the British Computer Society. In those days he was working on a National Elliott machine which, though having the same capacity as the ZX-81, was the size of "a side of a house".

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Edinburgh ZX Users' Club: J. Palmer (031 661 3183) or K Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80/81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Glasgow ZX-80/81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth monday of each month.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire, PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

National ZX-80 and ZX81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80/81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent, (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Post Office Users' Club: Vernon Quaintain, Head Post Office, St Martin's le Grand, London, EC1.

Scunthorpe ZX Club: C P Hazelton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: Andrew Moore, 1 Ketton Avenue, Sheffield S8 8PA would like people interested in starting a club in the area to contact him enclosing a stamped-addressed envelope for details.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium, France, Luxembourg: Club Sinclair, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468)

Belgium, Netherlands: Microcomputer Vereniging BZW, Paul Glenisson, Priester de l'Epéestraat 14, B-1200 Brussels, Belgium (322 7349954)

Denmark: Danmarks National ZX-80/81 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jenczyk, Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Republic of Ireland: Irish ZX-80/81 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611. — Harvard Group, Bolton Road, Harvard MA 01451; (617 456 3967).



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SAVE £20 on a Sinclair ZX-81 kit. A special offer open only to readers of *Sinclair User* has been negotiated with Sinclair Research, which means you can buy the world-beating ZX-81 for just £29.95 (plus post and packing).

Stocks are limited, so be sure to place your order soon. Allow 28 days for delivery. Maximum four units per applicant.

To: Sinclair User Special Offer,
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